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THE METAL INDUSTRY

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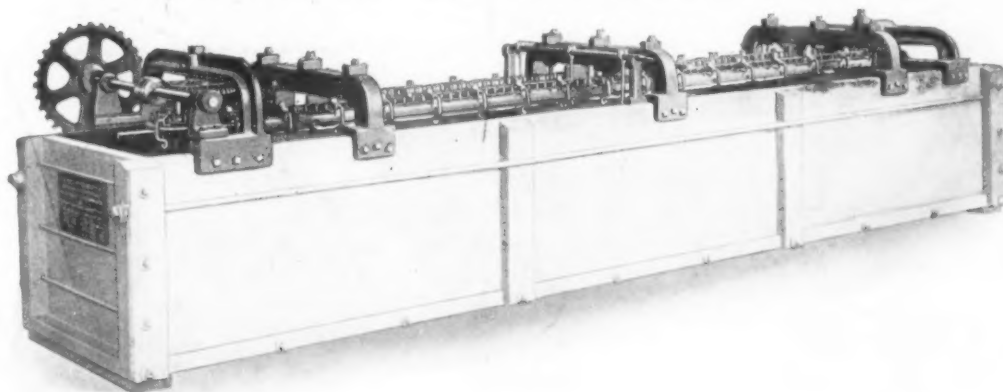
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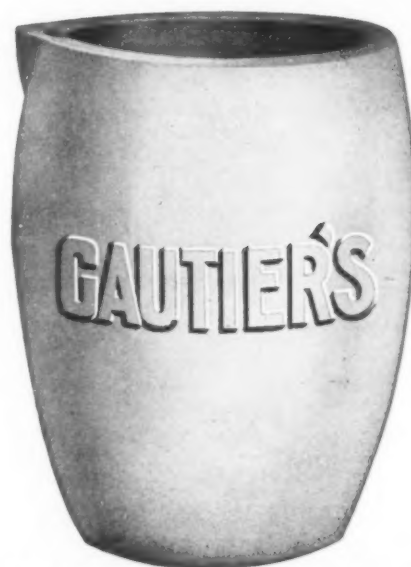
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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

Vol. 15.

NEW YORK, MAY, 1917.

No. 5.

CHINESE METAL MANUFACTURES

A DESCRIPTION OF THE PRODUCTION OF ARTISTIC ARTICLES IN SILVER, COPPER, BRASS AND PEWTER BY THE METAL WORKERS OF INTERIOR CHINA.

WRITTEN FOR THE METAL INDUSTRY BY H. K. RICHARDSON.

The perfection and charm of the brass and silver articles offered to tourists in the coast cities of China has excited the wonder of many people. The skill shown in

equally attractive brass shops in the native quarters. The transient traveller cannot understand why things can be sold at such low prices, but to one who has lived



FIG. 1.—TOP ROW.—STAND FOR URN, note attempt at English alphabet, (Cast); LARGE URN AND COVER, 2 Pieces, (Cast); BOWL (Cast). SECOND ROW.—TAILOR'S SMOOTHING IRON (Cast); WIRE BOUND BRUSH AND HANDLE (Coor Palm Fiber); LETTER MARGIN, used to insure margin in writing letters, (Casting, not Engraved). THIRD ROW.—WIRE BRASS; LOCK, bolt closed; BRASS LOCK MOLD; KEY; LOCK, opened; BOLT; LOCK (Casting); BOLT (Casting Unfinished).

the manufacture of these articles and the low price at which they are sold are the astonishing features. Few travellers passing through Shanghai fail to visit the magnificent silver shops on Nanking road, or the small but

in the interior, the large number of brass workers and silversmiths found literally everywhere furnish an adequate reason. Every village, no matter how small, boasts of its brass worker and few there are without a silver-

smith. As is the case with most of the native industries, the workers in the interior are least affected by foreign styles. In the interior villages far from foreign intrusion one can see the process of metal work as it has remained unchanged in the slightest detail for over a thousand years.

It was the writer's privilege to reside for three years at Chengtu, the capital city of the province of Szechuen, about 1,800 miles into the interior from Shanghai. Chengtu is the acknowledged center of the hammered copper industry of western China. It is a city of 600,000 inhabitants, of which fully one-tenth are connected with the brass, copper, pewter and silver working trades. During the three years spent in this city the writer had occasion to have work done by all the various types of workers. The facts collected in this intimate way form the basis of this article, the object of which is to show, the crudeness yet thoroughness of methods developed centuries ago and held without improvement for over a thousand years and the economic conditions which allow of the product being sold so cheaply.

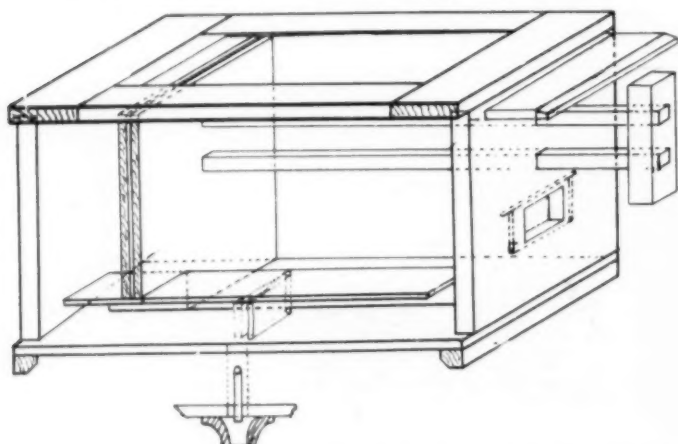


FIG. 2.—VIEW OF WINDOW-BELLOWS, FRONT REMOVED. BELOW.—SECTION OF FRONT AT OUTLET.

For sake of clearness the technique of each process will be discussed separately. Since the economic conditions of all classes of metal workers is the same a common discussion of this feature will suffice.

The most prominent metal workers are, in the order of their apparent abundance:

- (1) Brass, casting and wrought shops.
- (2) Silversmiths, including gold working.
- (3) Pewter, and soldered ware.
- (4) Copper, hammered ware.
- (5) Wire Drawing, brass, copper, silver and iron.

Each of these is discussed in detail.

(1) **BRASS WORKERS.** Brass shops are seen on every street and give employment to the greatest number of metalworkers. There is some tendency to specialization, some shops do only castings, some only hammered work and in a few cases specialization is carried further, for shops making locks rarely do anything else.

The number and prominence of the brass shops can be readily understood from an enumeration of a few of the practical articles made from brass and in daily use in Chinese homes.

CAST BRASS. Braziers and incense burners, pen and brush protectors, candlesticks, lamps (cheap grade), paper guides used in letter writing, tea saucers (cheap grade), bells for the family altar, idols (small) for temples, locks, spoons, pipes, cigar and water (cheap grades).

WROUGHT BRASS. Hinges, barbers' wash basins, trunk trimmings, rulers for writing, ink boxes, hand warmers,

thimbles and rings, tea pots, tailor's tools, tea saucers (best grade), watchman's gongs, pipes (water), best grade, lamps, best grades.

WIRE BRASS. Parts of stamped ornaments, ear rings, hair ornaments, chains, springs, wiring for artificial flowers.

Brass workers distinguish two grades of brass:

(1) "Seng Tung."—Casting Brass, a cheap brittle mixture.

(2) "Su Tung."—Wrought Brass, a tough mixture that can be hammered.

The two alloys most in use as given by the Chinese are:

(A) Copper16 ounces59.2%
Zinc11 "40.8%

This is the brittle casting mixture.

(B) Copper16 ounces72.7%
Zinc5.6 "27.3%

This is the wrought or Hammering brass.



FIG. 3.—FIRST ROW.—WIND BOX (Model); PEWTER LAMP (Hammered Copper Tips). SECOND ROW.—HAMMERED COPPER HOT WATER KETTLE; PEWTER TEA SAUCERS. THIRD ROW.—COPPER URN (Cast); BELL HAMMER; URN. Made from bronze brought from temple on Mount Omei.

Very little of (A) is made up from virgin metal, most of the castings are made from scrap material. All brass dealers are very careful to sort out the two kinds of scrap brass.

The prices at which the various grades of brass sold on Jan. 27, 1916, were:

Casting brass—16 cash per oz. or \$0.06 per lb. (U. S.)
Wrought " —28 " " " " \$0.105 " " "
Pure Copper —70 " " " " \$0.263 " " "

In view of the high price of copper, the low price of brass can be explained only on the assumption that considerable scrap is used.

In 1904 Native copper sold at 16.6 cents per lb.
" " " zinc " " 4.7 " " "

Most of the copper used is native from the mines in the northern and southwestern sections of the province. The zinc all comes from the adjacent southern province of Yunnan.

The casting alloy is used for heavy articles and where little strength is required. Its chief recommendation is its cheapness.

The wrought alloy is used for wire drawing, all hammered work and for castings where strength and thinness are important as in locks.

THE BRASS CASTING PROCESS.

There are two methods of casting which can be designated by the type of mold used,

- (1) Sand mold casting.
- (2) Brass mold casting.

(1) SAND MOLD CASTING.

The sand mold casting practice differs so little from current American hand practice, that one is soon convinced that this type of casting has been handed down from Chinese antiquity with very little change except refinements of detail. The Chinese molder mixes his molding sand with molasses, places it into one-half of a bi-parted flask or mold box, forces his pattern into the sand,

gate and the edges of the cavity are repaired and the mold is ready for use by the time the apprentice has melted another crucible of metal. A mold is used many times before the sand is knocked out of the flask and re-tamped. A little water is sprinkled over the surface of the sand to keep it moist. Practically all of the melting is done in small clay crucibles of local manufacture. Each crucible holds three to four or six to ten pounds. They last many heats. The heat is obtained by coke in a pot furnace made up from stone and mud. Forced draft is obtained by means of a wooden wind box. This is a very ingenious affair and is shown in isometric projection in Fig. 2 and photo in Fig. 3.

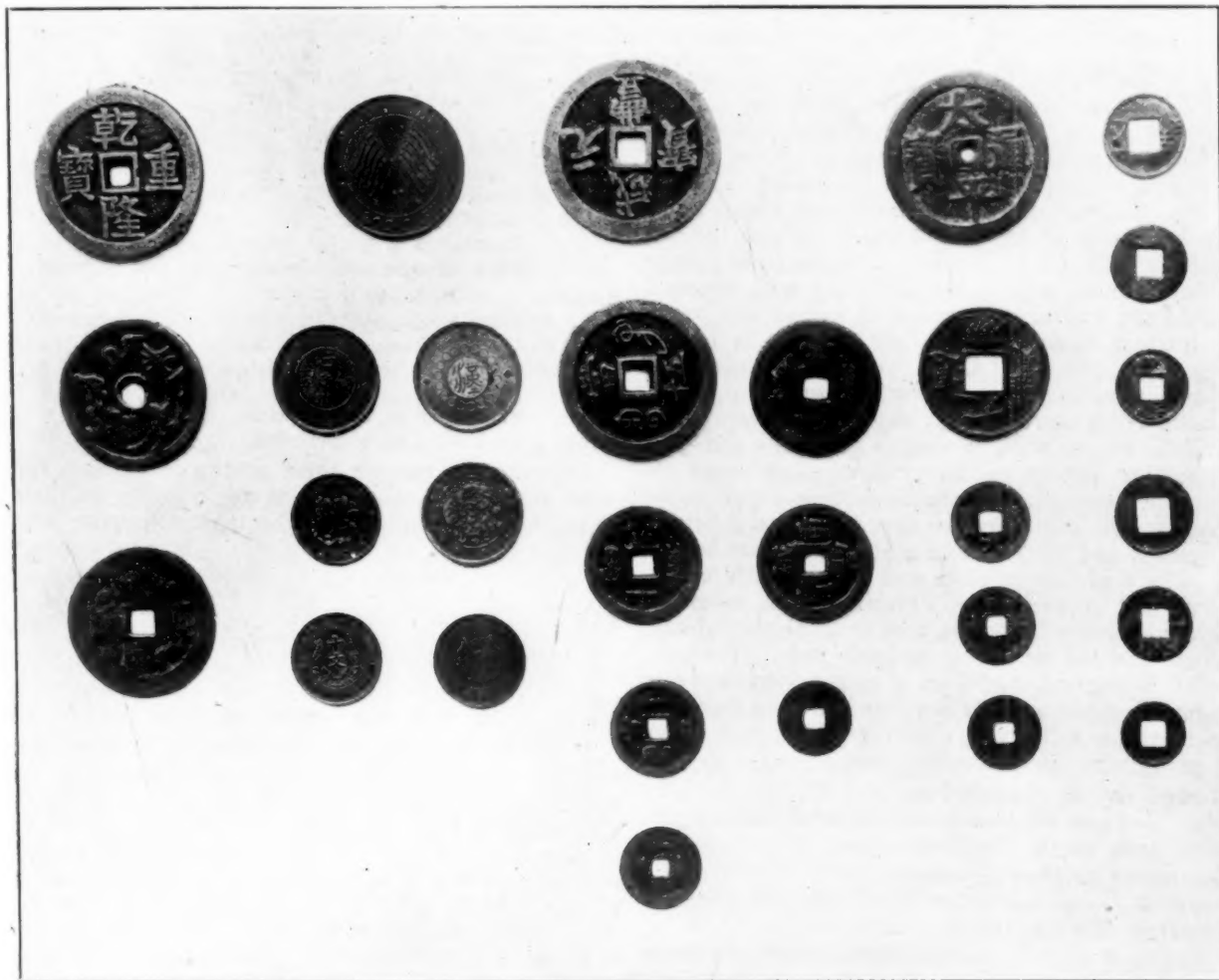


FIG. 4.—A COLLECTION OF COPPER AND BRASS COINS—ANCIENT AND MODERN.

puts on the top half of the flask, dusts his pattern with charcoal dust, fills up flask, tamping thoroughly. The mold box or flask is then reversed and the sand removed from the first half. The pattern is dusted and the sand replaced, tamping it thoroughly, the two halves of the flask are carefully separated, the pattern withdrawn and all edges smoothed and repaired. No risers are provided, only a gate is dug out in the sand. Before pouring the two halves of the mold are placed up side down on a frame work and the surfaces well smoked in the soot from pitch or rosin held under them on a red hot shovel. This is making and applying the foundry facing in one operation. The metal is poured into the gate while very hot. The metal has only cooled enough to harden when the gate is twisted off and returned to the crucible. The mold is carefully taken apart, and the casting removed with as little disturbance of the sand as possible. The

A sample of the types of articles made by this process is shown in photo, Fig. 1.

BRASS MOLD CASTING.

A far more interesting and unique process is that of casting Chinese locks. For this purpose brass molds are usually employed. The mold serves two purposes: (1) it is the core box, (2) it is a combined mold and flask.

To understand the ingeniousness of the process it is necessary to know the construction of a Chinese lock. Fig. 1 shows a lock and its key partially opened, and also closed lock.

The mold used for this work is shown dismantled and complete in Fig. 1.

The method of procedure is as follows:

(1) MAKING OF CORE.

The thin pieces (A to D) Fig 1, are placed in one-

half of the heavy mold E and the core sand packed around the iron wire (through hole in D), the other half F of the mold is placed on top of E and the two halves brought tightly together in a ring vise. The two halves of the mold (E and F) are taken off, the thin pieces A, B and C carefully removed and the core lifted by the piece D. The core is then removed by a spatula from the lifter D, care being taken not to disturb the iron wire. The core is baked on top of the brass furnace for half a

day. The baked core is then centered in the assembled brass mold (E and F) by the iron wire and very hot wrought brass poured around the core until it reaches the top of the core. See Fig. 1. The finished casting is withdrawn from the brass molds, the iron wire taken out and the sand shaken from the inside, after which it is finished by filing. Another application of this method was the casting of the old cash coins shown in Fig. 4. (To be continued.)

RACK INSULATION

A REPORT OF SOME EXPERIMENTS MADE IN THE SEARCH FOR A NON-CONDUCTING MATERIAL.

WRITTEN FOR THE METAL INDUSTRY BY W. H. WEBER, EXPERIMENTAL ENGINEER THE ZENITH CARBURETOR COMPANY, DETROIT, MICH.

There is one branch in the field of electroplating on which I fail to find much instructive literature, and for this reason I would like to give in detail a few experiments which I made in the insulation of plating racks. I have known several chemists who have worked on the subject but in a very secretive manner and with but indifferent success in so far as I know. Perhaps the immense saving has not been pointed out to the right parties yet; at any rate the men of responsibility with whom I have talked the matter over failed to evince any but a cursory interest in the subject. As the results of the following experiments will show, there is certainly a reward worth attaining in a successful insulation.

The racks which served for my experiments were made of electrolytic copper rods, riveted at the joints and capable of holding twenty ordinary alarm clock cases on suitable copper springs. At the time these experiments were made it was customary to give the cases a fifteen minute cyanide and forty minute acid copper plate before buffing. The acid copper plate was subsequently eliminated, sufficient copper being deposited in a so-called "rapid cyanide copper" solution, used at an almost boiling temperature and fed on sodium cyanide only. The efficiency of this solution, based on a comparison between the amount of copper actually deposited and the theoretical amount rarely fell below eighty per cent and often reached as high as ninety-five per cent.

Actual copper deposited—
Theoretical amt't which should deposit
Grams copper as weighed on sample
Amperes. Minutes. 0.0394
= Efficiency or,
= per-cent efficient.

The cases and racks were weighed separately before each deposition. The solutions were chosen at random—cyanide copper solution analyzed about five ounces each of copper and free cyanide to the gallon and acid copper was of the usual 20° Bé. type saturated with copper sulphate and brought to about 20° Bé. with a little sulphuric acid and both new, old, and medium racks were used. By old racks is meant racks ready to be scrapped. The medium rack was one which had lived about half its life. Following are the results obtained:

Exp.			Lbs.	Oz.
1.	New Rack.			
	20 Cases	weighed	2	6.71
	20 Cases after cy. copper plate.....	"	2	7.73
	20 Cases after ac. copper plate.....	"	2	8.80
	Rack	"	5	3.85
	Rack after cy. copper plate.....	"	5	4.22
	Rack after ac. copper plate.....	"	5	4.59
2.	Old Rack.			
	20 Cases	weighed	2	7.61
	20 Cases after cy. copper plate.....	"	2	8.31
	20 Cases after ac. copper plate.....	"	2	9.54
	Rack	"	13	15.08

	Rack after cy. copper plate.....	weighed	13	15.48
	Rack after ac. copper plate.....	"	14	0.02
Exp. 3.	Medium Rack.			
	20 Cases	weighed	2	5.90
	20 Cases after cy. copper plate.....	"	2	6.70
	20 Cases after ac. copper plate.....	"	2	7.80
	Rack	"	10	2.69
	Rack after cy. copper plate.....	"	10	3.21
	Rack after ac. copper plate.....	"	10	3.81
Exp. 4.	New Rack.			
	20 Cases	weighed	2	5.80
	20 Cases after cy. copper plate.....	"	2	6.60
	20 Cases after ac. copper plate.....	"	2	8.00
	Rack	"	6	4.75
	Rack after cy. copper plate.....	"	6	5.00
	Rack after ac. copper plate.....	"	6	5.65

In order to compare these results and obtain the desired result, i. e., to ascertain the quantity of plate received by the rack the following table was constructed:

Exp.	Cases.			Racks.			Total Cases and Racks.	Per Cent. on Racks.
	Cy.	Ac.	Total.	Cy.	Ac.	Total.		
1	1.02	1.07	2.09	0.37	0.37	0.74	2.83	26.5
2	0.70	1.23	1.93	0.40	0.54	0.94	2.87	32.7
3	0.80	1.10	1.90	0.52	0.60	1.12	3.02	37.0
4	0.80	1.40	2.20	0.25	0.65	0.90	3.10	29.0

It will be seen that the percentage of copper on racks is about thirty per cent and for this particular case I think that a conservative estimate of thirty-three per cent waste is none too high.

This large waste is not only manifest in the amount of copper used but it also represents a waste of one third of the current used, it means great discomfort to the plater who must handle the old as well as the new racks. It means a large amount of pure copper to be used as scrap metal. With a view to eliminating some of this waste I secured some quarter inch aluminum rods and forced them through quarter inch Bakelite-Dilecto tubing and constructed a rack of this material, holding twenty-five per cent more work than the usual rack held. Under the same conditions the results of this experiment were as predicted, the cases receiving identically the same amount of copper per square inch as those plated on the normal racks and the insulation stood up beautifully. My one great difficulty was to secure sufficient rigidity to enable the rack to be handled as roughly as racks are usually handled. At the time I was obliged to abandon these experiments for more pressing work, but I sincerely believe that the above mentioned insulation can be used very advantageously, as suggested. Certainly the possibility of a twenty-five or more per cent increase in production without added cost for labor or material is incentive enough to cause the speedy development of a suitable insulation. The wonderful resistive qualities of Bakelite lend themselves most readily to the desired goal.

BRASS FOUNDRY PRACTICE

THE STORY OF THE TRIALS, TROUBLES AND TRIBULATIONS OF THE BRASS FOUNDER.

WRITTEN FOR THE METAL INDUSTRY BY W. R. DEAN, FOUNDRY SUPERINTENDENT.

Brass foundry foremen, superintendents and managers have had their troubles for generations but today they are multiplied ten-fold, with the high metal cost and labor high and scarce. Also, managers are being over run with efficiency experts, so called. Articles are appearing from time to time in the engineering and industrial magazines relative to scientific management, etc., and managers of industrial establishments read them, and without going into the thing thoroughly decide to improve their methods and start in on the foundry. Now there is no doubt the foundry of all places needs renovating, system and scientific management and it being one of the hardest places to organize, it is up to the superintendent and managers to keep hands off and call in an up to date, technically educated foundry superintendent, one who is thoroughly versed in scientific management and efficiency.

Efficiency, like patent medicines, is sometimes thought to be a cure-all, but in the hands of a skilled industrial engineer, is a remedy for a good many ailments. Everybody will allow that we in America are far from efficient, we see waste on every hand. Efficiency is the elimination of waste in time, material, power, light, etc.

Now, in the old days the foundry was run by rule of thumb, when labor was plentiful, the men were driven by the boss to do their uttermost. If a boss was not a driver, he was no good. Then if a man refused to be driven, he was fired and a new man substituted, but to-day with our prosperous times, men will not be driven and so we must find some other way to get the work done. Sometimes these things are not taken into consideration by the management, who expects the foundry superintendent to get diamonds out of stones. If the foundry is located where it has to draw from different nationalities, the superintendent should know six or seven languages if he wishes to impart knowledge and then this does not always keep, as he usually has an uneducated, ignorant lot of men to try to teach. The foundry usually, on account of the heat, dirt, etc., gets the worst class of men for unskilled labor, and the way some of its labor moves around in the foundry would try the patience of Job. Still these men get the same wages as good, conscientious workers. Is that efficiency? Just when you think you have brought together, as good a crowd as you can under the circumstances, they hold you up for more wages. I do not blame them for getting all they can, but I do like to see them give value in return.

The labor trouble is not all we have to contend with, the metal market has the foundry man on the run also, and there is a strong tendency to forget quality for lowest prices. To overcome the rising high cost of foundry production, managers are looking to efficiency methods, systematizing and scientific management. But where most of them fall down is only doing the thing half way or by using their own untried ideas. Now a manager of a corporation should no more say how to install a method than he should tell a doctor what to give him when he is sick. The logical way is to pick the right man the first time and after choosing him, trust him as you would your doctor and give him time to diagnose your case and effect a remedy. The manager will know when he is being benefited as well as when he is being cured by his doc-

tor, but to interfere and suggest this and that in a way that allows of no alternative to the superintendent is the height of folly. Suggestions can be given but they should be thought over and thoroughly considered pro and con before being tried out. "Be sure you are right, then go ahead." They should remember that the superintendent has had more experience along these lines than they have and he is basing his ideas upon former experiences. Unless a man has worked up from the shops, he does not realize all the conditions one has to contend with. His ideas may be theoretically good but will not work out in every day practice for a long time to come or until the ground is ready. I have listened to good ideas from managers that were along the lines of scientific management but when they wanted them carried out, you would be up against any amount of trouble right away. The conditions were about the same as taking a piece of worn out land and trying to raise 350 bushels of potatoes to the acre. Three hundred and fifty bushels of potatoes to the acre is possible, but not until you have spent a few years in getting the land ready. That is where the foundry superintendent has his troubles. The managers mean well but don't know or realize all the things the superintendent has to contend with, and are impatient for results.

Another trouble the foundry superintendent may experience is being in contact with an organization that is not running smoothly. He may be called upon to please one man of set ideas and then again to please another official with entirely different ideas, ideas that conflict, perhaps. When in this predicament, he has very little chance to accomplish satisfactory results, or to get ahead as fast as he should.

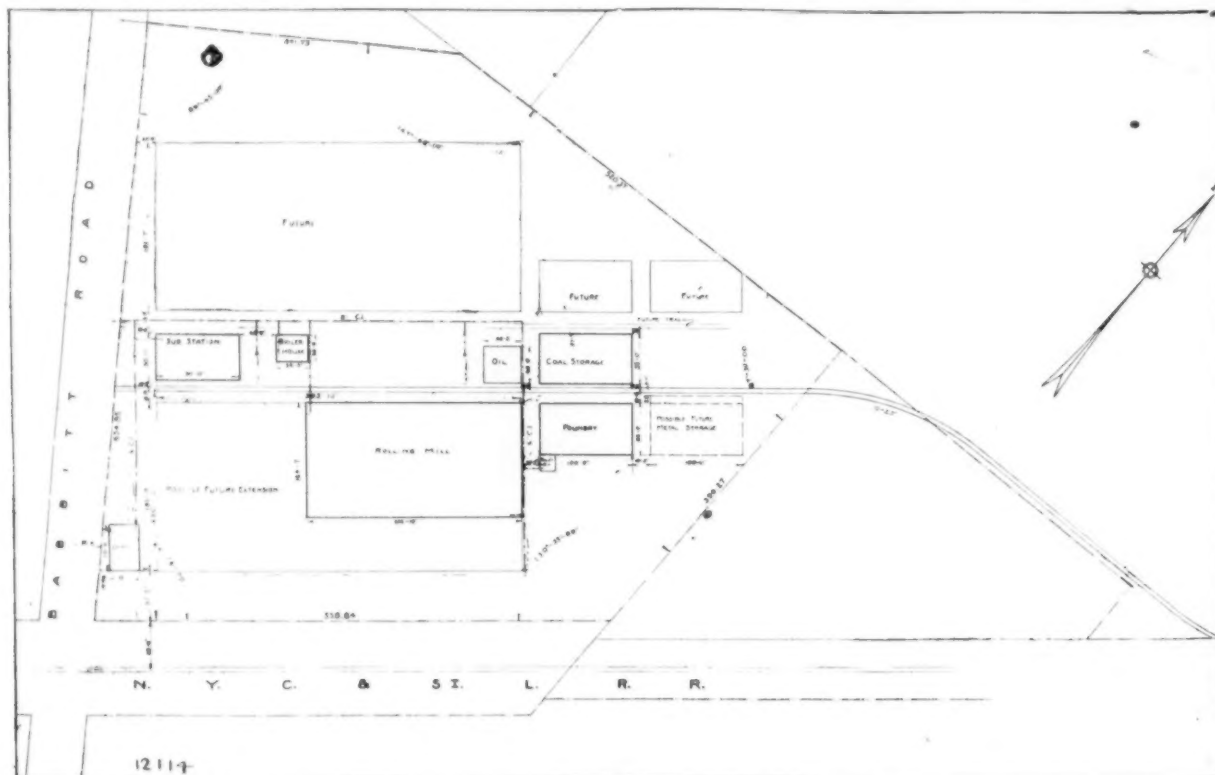
Often when hiring a new superintendent, the manager makes things look considerably better than they really are or will be; knowing their defects, etc., he tries to cover them by excuses or does not mention them at all. Of course this is natural on both sides but as the manager has the upper hand at all times, it is deplorable on his part. For instance, a foundry advertising, for a foreman or superintendent, or telling about the position claims to have first class metal for making high grade castings. After a few weeks the man having accepted the position, is given the poorest kind of metal and expected to make as good castings as he would out of first class metal. He finds he has the purchasing department to contend with. Now the purchasing department should work in conjunction with the foundry, but usually works just the opposite.

If anything is needed to produce good castings it is good metal. You can no more get good, clean castings out of old burnt metal and poor copper than you can get diamonds out of your black lead barrel. Metal on the outside apparently looks all right, but analysis shows it to be unfit for high grade, clean castings. Poor copper is detrimental. Beware of casting coppers, and old scrap that has had rubber insulation. All casting coppers are not bad, but so many are for pressure castings, that it is best to be on the look out. A good many contain bismuth and antimony, both undesirable metals to have in copper for high grade work. I have seen castings crack and shrink, made out of casting copper as a base in the alloy, that otherwise gave no trouble. Then see the purchasing agent with-

out any apparent regard for the foundry, order the same copper over and over again. Excessive loss of castings all the time, and still the management keeps trying new men in hopes of cutting down the loss and tells the man engaged that he buys the best of metal to work with and expects the superintendent to get losses down to a minimum under those conditions. Then again, I have seen miscellaneous scrap bought for high grade work, where there was no room or time to sort it, containing manganese bronze, yellow brass, excessive iron and burnt metal, etc. Now scrap can be used advantageously if it is melted into ingots first and the necessary copper, etc. added to make it the required mixture; but to have to use it as it is and expect the best of castings is misplaced judgment. But I have seen it done because there was no copper on

in the metal; the more it is agitated on stirring and pouring, and the larger the gate the more oxide gets into the casting. Also as the zinc increases, the metal has to be hotter to run the castings, so more oxide again.

Now we can not change gates back and forth on gated work just to suit our metal we are pouring, so we must keep our metal at a standard mixture. If the purchasing department does not work in conjunction with the foundry and buys what is cheap and not what is good, why it is impossible for the foundry man to keep the loss down to a minimum. I have seen the defective castings go as high as 40%, with only miscellaneous scrap to use and drop to 5% when good copper was on hand. Still the purchasing department would keep on buying the same kind of metal, let the



THE PROJECTED PLANT OF THE CLEVELAND, OHIO, BRASS AND COPPER COMPANY NOW BEING ERECTED BY WESTINGHOUSE CHURCH KERR & COMPANY, NEW YORK.

hand to make part new metal, and the castings were wanted badly by the factory and they got them bad! Now, if things had been standardized and planned as would have been done under scientific management the stock room would not have been out of good copper; would have had time and space to have assorted the scrap and better castings as a result would have been the order.

Now miscellaneous scrap, and I am speaking of red brass, or composition scrap for water pressure work and the like, usually has an excessive amount of zinc in it when all melted together just as it comes. That is, an excessive amount for work gated for red brass as 85 copper, 5 zinc, 5 tin, 5 lead, or 80 copper, 2 tin, 6 lead, 12 zinc. After the amount of zinc in a metal goes over 5 to 8 the gating should have careful consideration for holding back the zinc oxide. Up to 12 zinc or spelter, not so much attention is needed but after going over 12, then the size of the gate, etc., needs looking after. The more spelter, the more zinc oxide

copper stock run out and the management would expect the castings to be perfect or nearly so. I have had managers and superintendents tell me that castings would be fine for a while "leaks" down to 6 or 7% loss, then all at once go to 15 or 20%, and no one seemed to know the cause. They would have theories, but that did not stop it. And what is more, no one went into it thoroughly to find out the cause. Now bad castings are traceable to a good many causes and no one cause is responsible entirely, therefore if you have no previous data to work on it takes time to improve all causes and figure out the most flagrant, and remedy it, and as I have said the kind of metal and gating has a whole lot to do with defective castings. These are not mere theories, but have been proven by the author after many years of study and testing. Standardized conditions and planning as taught by scientific management would have eliminated this cause at the start.

(To be continued)

ANTIMONY PLATING FROM THE FLUORIDE BATH AND THE TESTING OF OTHER ANTIMONY BATHS

WRITTEN FOR THE METAL INDUSTRY BY F. C. MATHERS, K. S. MEANS AND B. F. RICHARD, INDIANA UNIVERSITY, BLOOMINGTON, IND.

"Electrodepositions of antimony are but seldom made use of in the industries, though they are very suitable for decorative contrasts. This is no doubt due to the fact that a thoroughly reliable bath yielding deposits without the appearance of drawbacks during the operation is, thus far, not known."*

This statement by Langbein sums up the reasons for the present state of the art of antimony plating. This paper describes the experiments with the antimony fluoride bath which was found to be satisfactory.

The new and the essential thing in producing grey, finely crystalline deposits of antimony of any desired thickness ($\frac{1}{4}$ in. or more) is to add small amounts of some organic addition agent to the bath. Several satisfactory addition agents were discovered, but aloin (0.03 oz. per gal. of bath for each 12 hours of electrolysis) is recommended because it is the cheapest one that gives good deposits.

This bath is entirely stable, at least no sign of decomposition or change was noted during the course of these experiments. It is easy to operate and always gives a good deposit unless too much of the addition agent has been used. If this one precaution is observed, the bath is as sure in its operation as a nickel bath. The bath is inexpensive and easily prepared.

The great advantages of antimony fluoride as the basis of a plating bath are its ready solubility in water without hydrolysis and its freedom from deterioration or change during electrolysis, due to its inorganic nature. No other antimony salt possesses these essential properties.

The baths contained 6.6 oz. of antimony as the fluoride and 4 oz. of free hydrofluoric acid per gallon and were made by dissolving 8 oz. of antimony oxide (Sb_2O_3) in a lead vessel in 15 oz. of 48 per cent. hydrofluoric acid. The solution was then filtered and diluted to one gallon.

These baths, for the first two or three days of electrolysis, gave rough striated deposits which were probably due to impurities in the antimony oxide or in the hydrofluoric acid. Tests upon a bath or plating from a bath should not be attempted until after this preliminary electrolysis.

A current of 7.4 amp. per sq. ft. (0.8 amp. per sq. dec.) was used. Ten amperes per sq. ft. could be used, but the deposits were less smooth and, with still higher currents, they became rougher if attempts were made to produce thick deposits. For the plating of thin deposits, the heavy currents can be used without difficulty. The voltage was 0.65 with the cathode midway between the two anodes which were 1.75 to 2 in. (4 to 5 cm.) apart. The total area of each cathode was 7.7 sq. in. (50 sq. cm.). The active anode area was about 4.6 sq. in.

Base metals, such as lead or copper, which are used in making connections with the anodes are dissolved by the bath if they extend into the solution. The solution should be stirred or mixed sufficiently to prevent the upper and lower parts from becoming appreciably different in concentration. In these experiments the baths were stirred continuously by a slow current of air bubbles. Cloth bags were placed around the anodes to prevent slime from being carried to the cathode and roughening them. Unless the bath is in constant use, continuous stirring and bags around the anodes are not necessary; the bath can be stirred at periods when it is convenient to allow time for the sediment to settle again. The baths must be used in wood, lead, wax or hard rubber vessels because hydrofluoric acid attacks glass, earthenware, porcelain, etc.

*Langbein, *Electrodeposition of Metals*, page 478 (1913).

The experiments which were made in developing the fluoride bath deal almost entirely with the use of various organic addition agents for restraining the crystalline structure of the antimony deposit. Each bath was 0.42 pint (200 cc.) in volume. A new portion of addition agent was added to each bath every twelve hours to replace that which was used up by the electrolysis. The addition agent can be introduced conveniently as a solution in water or in alcohol if it is insoluble in water. The strength of this solution was generally in the proportion of 4 oz. per gal.

No Addition Agents.—Deposits from baths containing only antimony fluoride and free hydrofluoric acid were crystalline. Many of the crystals formed pointed projections and some of those on the edges of the cathode produces short-circuits. A thick deposit was very rough, but the crystals were coherent and no more brittle than ordinary cast antimony. (See cathode 4 in the figure).

The classes of organic substances which were found to give the best results are phenols, vegetable extracts, alkaloids and aromatic acids.

PHENOLS.

Resorcinol, alpha-naphthol or beta-naphthol (0.033 oz. per gal. twice daily) gave grey, finely crystalline, smooth deposits. The cathode with resorcinol was smooth even when it had remained in the bath until it was thick and heavy. (See 2 in the figure). Resorcinol was perhaps the best addition agent found, but its cost (\$1.75 per oz.) is prohibitive. The naphthols (\$3.50 per lb.) are more expensive than the aloin which gives as good a deposit.

Phenol or carbolic acid (0.08 oz. per gal. twice daily) gave a more crystalline deposit which showed a tendency towards roughness on the edges. This simple phenol was less active and less beneficial than the more complex ones.

Picric acid, a nitrated phenol, caused the bath to darken and the deposit to become spongy in a short time.

VEGETABLE EXTRACTS.

Aloin (0.033 oz. per gal. twice daily) gave a deposit which was the equal of any obtained during this work. The simultaneous addition of 2 drops of clove oil per gallon made the deposit smoother, more glossy and of a darker color. This quantity of clove oil was used up in 6 to 7 hours as was shown by the appearance of the cathode changing from glossy and lustrous to a grey. This deposit with the aloin and clove oil was the smoothest of any but it did not have the grey color of ordinary antimony. Aloin is probably the best addition agent to use in view of its low cost (about \$1.25 per lb.). About 72 grains (4.5 gms.) of aloin costing $1\frac{1}{4}$ cents is required for the deposition of 1 pound of antimony. A solution of aloin could be obtained from crude aloes at a much lower cost. The aloin imparts a yellow color to the bath which gradually disappears during electrolysis, thus clearly showing when the addition agent is nearing exhaustion. The operator soon learns to judge from the depth of color whether or not too much or too little aloin is present.

Gum arabic (0.3 oz. per gal. twice daily) gave slightly striated deposits which were free from cracks but were rough on the edges. A larger amount of the gum arabic (0.06 oz. per gal.) made the deposits smoother and somewhat glossy.

Tannic acid (0.002 to 0.02 oz. per gal. twice daily) gave dark striated deposits with the smaller quantities and spongy deposits with the larger amounts.

AROMATIC ACIDS.

Salicylic or benzoic acid (0.02 oz. per gal. twice daily) gave smooth non-crystalline deposits. Salicylic gave the better deposit which, however, was not quite as good as with aloin. Salicylic acid is more expensive than aloin.

Phthallic acid (0.002 oz. per gal. twice daily) gave a fairly good deposit, slightly rough upon the edges. The phthallic acid was much more active than the simple acids as was shown by the smaller quantity required and by the cracking of the deposit if a slight excess was used.

Alkaloids.—The alkaloids, quinine, strychnine and morphine, gave smooth deposits, which, however, were somewhat too thick upon the edges. In each case, 0.02 oz. per gal. twice daily was added. This amount of strychnine was in excess of the requirement as was shown by the fact that the bath continued to give a good deposit for many days after the addition of the strychnine was discontinued. The morphine gave the best deposit as was shown by the greater smoothness of the edges. The alkaloids are too expensive to be used commercially, although they give satisfactory deposits, especially in the case of the morphine.

ESSENTIAL OILS.

The essential oils were so active that it was impossible to maintain uniformly the proper quantity in the baths. Any excess caused the deposits to crack and break away from the starting sheets while any deficiency failed to restrain the formation of crystals. Clove oil was the most powerful one that was tried; 0.016 oz. per gal. twice daily produced an apparently non-crystalline deposit, although it had rough but rounded projections on the edges where the current density or voltage was high. However, the deposit was so hard and strained that very much of it cracked from the starting sheet after electrolysis for some time. This quantity of clove oil in the presence of other addition agents does not cause the deposit to crack, but does produce a darker colored, smoother deposit. All of the essential oils show this effect with every addition agent with which the experiment was tried. In some cases the second addition agent, for example, oxalic acid, had no apparent action on the deposit, yet it prevented the cracking which the clove oil ordinarily produced.

Cedar oil was less active and eucalyptus oil was still less active than the clove oil as regards the quantity that could be added without producing a badly cracked deposit, hence the best deposits were obtained with the eucalyptus. Thymol was about as active as the clove oil, hence it did not give good results.

These tests showed that the essential oils were not suitable addition agents for antimony.

GLUE AND PEPTONE.

Experiments with glue are always of special interest because glue is the addition agent that is the best known and most often employed or tried. In this case as in many others, glue is inferior to other substances.

Glue (0.032 oz. per gal. twice daily) gave a peculiarly striated deposit which showed a tendency towards projections on the edges. The deposit was distinctly crystalline. Larger amounts of the glue (0.07 oz.) made the deposit smoother, and after this quantity had been added for a number of days the deposit became very dark and glossy and slightly cracked.

Still larger quantities of glue (0.1 oz. per gal. twice daily) gave a deposit which showed no indication of crystalline structure. There was also less roughness on the edges, but it was very glossy and showed several cracks. The longer the bath was run the more glossy the deposit. This seemed to indicate an accumulation of

glue in the bath, but with a new cathode and the addition of no more glue, the deposit became grey and finely crystalline in 72 hours. Glue possesses one great advantage over many of the other addition agents in that an excess is less harmful in causing the deposits to crack. The simultaneous addition of very small amounts of an essential oil (0.008 oz. per gal.) made the deposits much more glossy.

Peptone, an animal product chemically somewhat similar to glue, (0.02 oz. per gal. twice daily) gave a fairly good deposit which was grey and finely crystalline but somewhat rough on the edges. Peptone was more active than the glue as shown by the badly cracked deposits which were produced by 0.03 oz. In no case was a glossy deposit produced.

AROMATIC ORGANIC ACIDS.

Oxalic, succinic or tartaric acid in quantities as large as 0.16 oz. per gal. twice daily gave deposits that were practically as crystalline as when no addition agent was present.

Sugars.—Sucrose, glucose and levulose (0.7 oz.) were practically without effect.

Miscellaneous Substances.—Such things as urea, formin and alcohol were without effect. Carbon disulphide or hydrogen sulphide made the deposits somewhat less crystalline and more smooth, but the total effect was small.

CURRENT EFFICIENCY.

The cathode efficiency, determined daily for 6 days, averaged 100.68 per cent. in a bath containing beta-naphthol and 100.38 per cent. in a bath containing aloin. The high values are probably due to the inclusion of electrolyte in the deposit.

The anode efficiencies could not be accurately determined due to the loss of slime which was produced by impurities.

PROPERTIES OF THE DEPOSITED ANTIMONY.

Specific Gravity.—The specific gravities of samples from the beta-naphthol bath were 6.68, 6.6 and 6.64 as determined in a specific gravity bottle against distilled water at 68 degs. Fahr. Cast antimony has a specific gravity of 6.7.

Brittleness.—The deposits, when struck, break perpendicularly to the starting sheet. The broken pieces show a structure in this direction resembling the grain in a split piece of fine grained wood.

TESTING OF OTHER ANTIMONY BATHS.

The superiority of the fluoride bath over the others that have been described in the books was shown by the following experiments upon the various baths that have been recommended for the electrodeposition of antimony. These baths were prepared and tested under the conditions that were prescribed in the books and journals.

Very few salts of antimony are available for use in a plating bath. The chloride, bromide and iodide are decomposed by the water with the formation of basic insoluble salts or sludge. This can be prevented by the presence of sufficient free hydrochloric, hydrobromic or hydriodic acid. These baths, in certain concentrations,² give crystalline deposits of explosive antimony which are unsuited for plating purposes. No composition was found that gave a smooth, thick deposit.

The sulphate, perchlorate, fluosilicate, fluoborate and nitrate are either insoluble or are decomposed too badly by the water to be of any use. This leaves only the fluoride among the inorganic acids.

As a result of these difficulties, most of the baths which

² Chem. News, 8,257.

are described in the books are prepared from complex salts with organic acids. These complex salts possess the important property of not hydrolyzing with the precipitation of a basic, insoluble salt when dissolved in water.

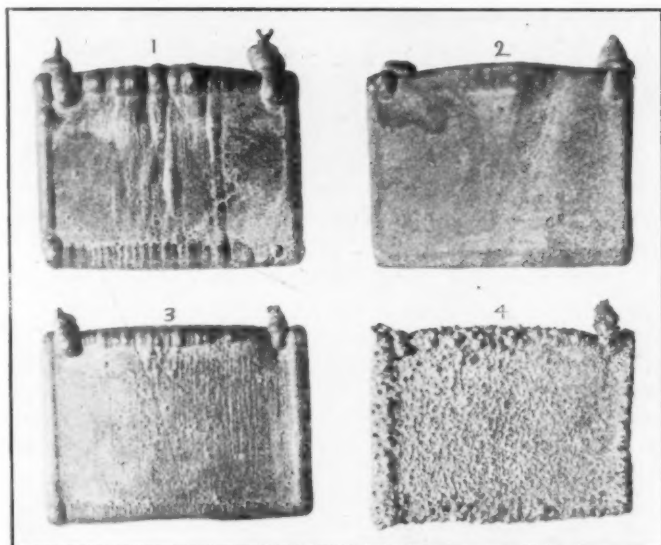
On the other hand, they have the very serious defects of requiring high voltages and of being slowly decomposed during electrolysis whereby the bath gradually changes until at last it fails to give a satisfactory deposit.

TARTRATE BATHS.

The baths that have been most generally recommended are those containing tartar emetic, tartaric acid and various other things. The following baths were tried:

No.	Ounces per gallon Tartar Emetic	Ounces per gallon Tartaric Acid	Other Things as Given
1	173	173	78 conc. HCl
2	10.6	10.6	4 ammonium chloride
3	8	5.3	
4	8	5.3	8 Rochelle Salts

Bath No. 1 gave a bright, smooth deposit which could



The baths, from which these cathodes were deposited, contained, per gallon, 6.6 oz. of antimony as the fluoride, 4 oz. of free hydrofluoric acid, and in addition agents as follows:

1. 0.033 oz. aloin and 2 drops of clove oil, twice daily.
2. 0.033 oz. resorcinol twice daily.
3. 0.033 oz. alphanaphthol twice daily.
4. No addition agent. (Note the roughness.)

The current density was 7.2 amp. per sq. ft.

be made of good thickness, but only a very small current or voltage could be used. Higher currents gave black or "burned" deposits. This bath is very concentrated, hence it is expensive to prepare. Metal can be deposited from it only very slowly. The deposit was never as good as from the fluoride. The other baths gave dark deposits and the voltages were high. These experiments show that the tartrate baths are unsatisfactory.

OXALATE BATHS.

The double salt of antimony oxalate with potassium or ammonium oxalate is soluble in water and does not hydrolyze. Baths containing this salt were not found described in the books, but the authors of this paper thought that it might prove satisfactory. Baths containing from 3.6 to 5.3 oz. of antimony trichloride, from 4 to 19 oz. ammonium oxalate and from 0.5 to 9 oz. of oxalic or acetic acid per gallon were tried. Good deposits could be obtained for a short time, but the baths rapidly deteriorated, the deposits becoming rough and finally

non-adherent. This trouble was due, at least in part, to poor solution of the anodes which gassed after becoming covered with a white hard coating. A purer metal as anode material or frequent complete cleaning and scratch brushing of the anodes might have overcome this trouble. The best deposit, which was finely crystalline and smooth, was obtained from a bath containing 10.5 oz. ammonium oxalate, 3.5 oz. antimony trichloride and 1.7 oz. oxalic acid per gallon. The addition of 0.03 to 0.07 oz. per gallon of gum arabic, glue, aloin or peptone made the deposits less crystalline and more smooth.

The oxalate baths, although good deposits can be obtained from them, are unsuited for plating work on account of the rapid deterioration which soon causes the deposits to become rough and non-adherent.

Almost equally good deposits were obtained with vegetable extracts (aloin), with phenols (resorcinol, alpha-naphthol or beta-naphthol), with aromatic acids (salicylic or benzoic) and with alkaloids (morphine). Glue, peptone and gum arabic were less satisfactory. The essential oils were exceptionally active, but were unsatisfactory largely for this reason. Some classes of substances, notably aliphatic acids and sugars were of no value.

As regards the essential radicals in the addition agents it seems that the aromatic hydroxyl (OH) or the carboxyl (COOH) is the necessary thing. Substances containing either of these groups have acid properties and also the property of forming compounds with metallic salts.

It seems that the formation of a complex between the addition agent and the antimony fluoride might be necessary for the beneficial action of the addition agent. Examples are given in the literature of compounds between metallic salts and active addition agents.

SUMMARY.

Satisfactory antimony deposits could not be obtained from any of the baths that are described in the literature or in the books upon plating. The tartar emetic (antimony potassium tartrate) bath, which is most highly recommended, can be made to give a good deposit, but a very concentrated bath and a very low current or voltage must be used. Antimony ammonium oxalate gives a good deposit until deterioration of the bath produces a spongy deposit.

Baths containing 6.6 oz. antimony as the fluoride, and 4 oz. of free hydrofluoric acid per gallon together with a suitable organic addition, give a smooth perfectly satisfactory deposit of any desired thickness. These baths are easy to operate and do not deteriorate. Without the organic addition agent the deposits are crystalline and rough when thick.

Aloin, resorcinol, beta-naphthol and alpha-naphthol are perhaps the most successful addition agents. The cost and ease of obtaining can govern the choice of the one to use. For each 12 hours of electrolysis at full capacity (84 amp. hours of current per gallon of bath), 0.033 oz. of the addition agent should be added for each gallon of bath. Aloin is at present the cheapest of the above addition agents.

If a shiny, glossy deposit is desired instead of the grey finely crystalline deposit, 2 drops of oil of cloves should be added every 5 or 6 hours in addition to the aloin. More clove oil than is sufficient to maintain the dark color causes the deposit to crack. The fading of the yellow color, which the aloin imparts to the solution, can be used as an indication of the need of more aloin.

The deposited antimony is brittle like ordinary cast antimony hence it cracks if bent or struck a blow.

Glue is not a satisfactory addition agent.

THE MANUFACTURE OF BRONZE POWDER

AN ILLUSTRATED DESCRIPTION OF ITS PRODUCTION IN GERMANY AND ITS INDUSTRIAL USES.

WRITTEN FOR THE METAL INDUSTRY BY OTTO VON-SCHLENK.

(Continued from April.)

We will proceed to describe the process of stamping the raw material into fine powder; this is the same for all materials, except aluminium, which will be discussed later on.

The raw material most frequently used is either sheet scrap or strips or flakes specially cast for this purpose. Both must, of course, be cleaned before being stamped. The sheet scrap must be freed from dirt, grease, etc., by washing in a solution of soda. For this purpose a scouring drum is used (see Fig. 7). This drum has a diameter of about 40 ins., and requires $1\frac{1}{2}$ h.p., running at a speed of about 40 r.p.m. Its capacity is from 10 cwt. to one ton per day.

The cast strip or flakes must be first put into a weak solution of sulphuric acid, and afterwards treated in a solution of cream of tartar.

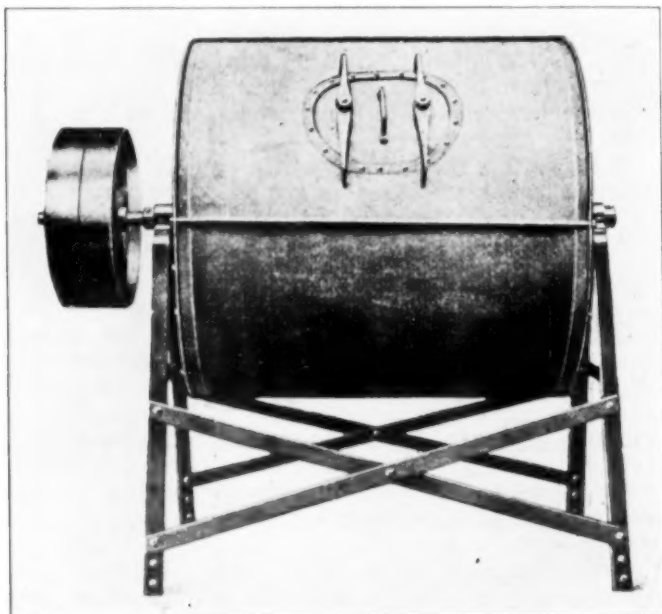


FIG. 7.—DRUM FOR SCOURING SCRAP MATERIAL.

The next step is to cut up the material into small pieces of about $\frac{1}{2}$ inch to 1 inch square. This is done by cutting them first into strips; putting them together in bundles and cutting the bundles up into small square pieces.

The material is now ready for the heavy stamp. About 40-50 lb. should be sprinkled with olive oil and put into the stamp. The quantity depends, of course, chiefly on the quality of the material and on its thickness. The thinner the material, the larger can the charge be. The above quantity is for soft metal of not more than about $\frac{1}{16}$ -in. Great care must be taken that the lubricating oil (from the rammer bearings) does not trickle down the rammers; should it do so, the metal would be spoiled.

The time of stamping depends again on the quality of the material and its thickness. No hard-and-fast rule can be given; it is only experience that enables the time to be approximately fixed for the duration of the stamping process. With an average quality and thickness the time required to disintegrate, say 40-50 lb. of scrap would be about 2-3 hours. The material should remain under

stamp until it is crushed into flakes of not less than $\frac{1}{4}$ -in. square and $\frac{1}{64}$ -in. thickness.

To inspect the charge without stopping the machine one of the rammers (preferably the one just behind the door) is stopped by inserting the catch and thus holding it up in its top position. After the charge has been in the machine for about one hour it should be inspected every quarter of an hour, and, when crushed to the state de-

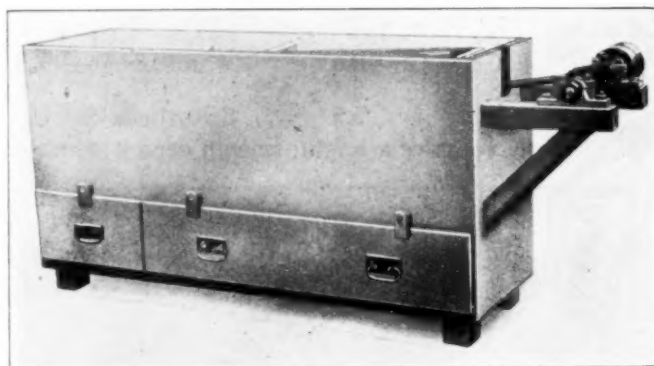


FIG. 8.—OPEN OR ROUGH SHAKING SIEVE FOR SIFTING THE STAMPED METAL.

scribed, the pot should be emptied into a specially shaped box, large enough to take at least 3 to 4 full charges.

If the charge is examined closely, it will be observed that the metal is by no means uniformly crushed. Some of the particles will be rather fine, like small fish-scales of, say, $\frac{1}{8}$ to $\frac{1}{4}$ inch diameter, and corresponding thickness; others will be larger, and probably a small proportion will

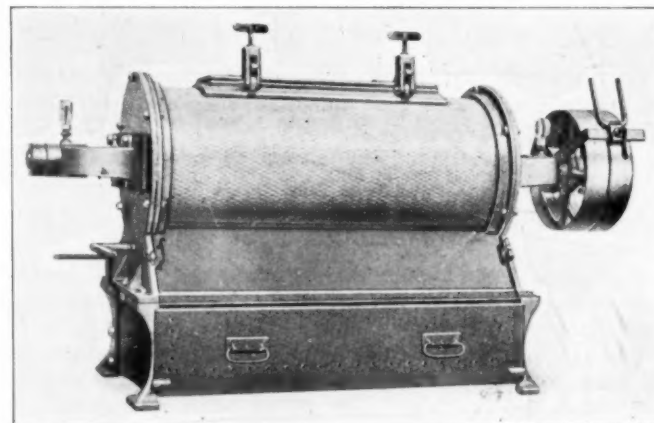


FIG. 8a.—SHAKING SIEVE FOR SIFTING POWDER BEFORE IT IS FINE STAMPED.

consist of fairly rough pieces of $\frac{1}{2}$ inch square and even more. Before continuing the crushing process in the medium stamp it is, therefore, necessary to obtain a more uniform material. For this purpose the stamped metal is sifted in an open shaking sieve such as shown in Fig. 8. This consists essentially of an open box, the top of which is formed by a sieve movable on two rollers. The sieve is moved to and fro by means of a pulley and crankshaft. The sieve being inclined and covering only four-fifths of the length of the frame, the tailings fall through into a small drawer (to the left in Fig. 8), while the sifted ma-

terial falls through into the long or main drawer. The sieve should have six meshes to the inch.

When the crushed metal taken out of the heavy stamp has gone through this rough sieve, the main drawer will contain a fairly uniform product of flakes not larger than about $\frac{1}{4}$ inch. The contents of the tailing drawer must be subjected again to the stamping process in the heavy stamp until it will pass through the shaving sieve. The capacity of the drawers of this sieve should be sufficiently large to take a whole day's output of one stamp. As it takes only a few minutes for the charge of one machine to be sifted through, only one of these rough sieves is required for every six or eight heavy stamps.

The contents of the main drawer—i.e., the sifted metal—is now ready for the medium stamp. This should also be charged with about 40 to 60 pounds. Instead of oil, a small quantity of stearine must be added, which should not exceed about $\frac{1}{2}$ per cent. in weight of the charge. The stearine can generally be only

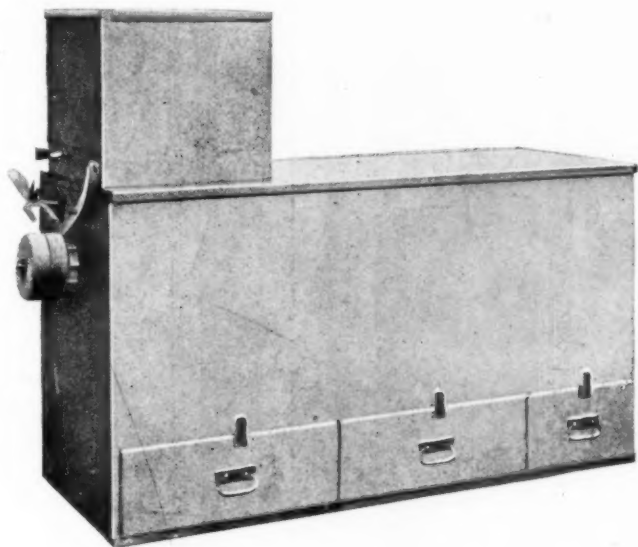


FIG. 9.—REVOLVING SIEVE FOR SEPARATING THE FINE POWDER FROM THE TAILINGS.

obtained in blocks, and should therefore be scraped into a very fine powder. It should be added to the metal before it is put into the stamp, and should be thoroughly mixed with it. The purpose of the stearine is to prevent an amalgamation or caking together of the very fine metal particles. These being subjected to the blows of the rammers get warm or, locally even hot; this heat in combination with the very great pressure would cause an amalgamation of the finest particles, and therefore a waste of material. The stearine melts on account of the heat developed in the interior of the stamp and covers all particles with an extremely fine film, which is sufficient protection against amalgamation.

In this stamp the material should be reduced into very fine flakes called "flitter" or "brocade."

As regards the time of stamping, much more attention is required to find out the right length of time than was the case with the heavy stamp. In the latter the rough pieces had to be reduced into small flakes, and it is obviously immaterial whether these small pieces vary slightly in size. It is also immaterial whether the metal remains in the stamp for, say, $2\frac{1}{2}$ hours or 3 hours. In the former case there will be more tailings, in the latter case less. With the medium stamp, however, the determination of the correct time of stamping is more important, and also more difficult.

As mentioned, the flakes must be reduced in the medium stamp into so-called "flitter" or "brocade." These are very fine flakes about 1-3,000 to 1-5,000 inch thick, and not more than about 1-32 to 1-24th inch long and wide. It is, however, impossible to reduce the bulk of the material to such dimensions without crushing a certain proportion to dimensions nearly approaching powder. If this percentage of very fine stuff is too large, there is danger that this fine stuff is baked together on account of the weight of the rammers being too large for the fine material. It is, therefore, very important not to "over-stamp" the material, i.e., not to stamp too large a percentage into powder.

The exact time depends again on the quality of the material and on the size of the flakes put into the stamp. Under average conditions it would take $2\frac{1}{2}$ to 4 hours to crush 50 lb. into "flitter." The exact time must be determined by experiments. After some practice the foreman will have had sufficient experience to be able to estimate with accuracy the time required to stamp a given quantity of flakes into "flitter."

When describing this stamp we mentioned that it was fitted with a stirring device and a leather bag. The fine powder that is already produced in this stamp is thrown up by the stirring device and afterwards thrown into the leather bag. As soon as that is about half-full it must be taken off and emptied. The powder is finished, and it need not be stamped any more, but is ready to be either ground or polished.

The "flitter" or "brocade" taken out of the medium stamp is now ready for the final disintegration into finest powder. Before it is put into the fine stamp it must be sifted, in order that all rough particles are eliminated. For this sifting process a shaking sieve is used, similar to that shown in Fig. 8a. The only difference between this fine shaking sieve and the rough sieve is that the former is entirely enclosed.

The material to be sifted is put into a hopper, and falls down slowly on to the wire sieve, which consists of brass gauze with about 36 meshes to the inch. The tailings are put back for further breaking up into the medium stamping machine, while the sifted material, the brocade, is ready for the fine stamp.

This stamp consists of four posts, each of which is to be charged with about 12-15 lb. of "flitter." The difficulties connected with the amalgamation are here, of course, much more accentuated. Hence it is advisable to add at least $\frac{3}{4}$ to 1 per cent. of stearine to each charge. The average time taken to complete the crushing into fine powder is about 3 to 4 hours. The utmost care must be exercised *not* to stamp the powder too long, because there is for each material a critical period; if this is exceeded, the fine, impalpable powder changes its structure suddenly, and becomes rough and sandy, utterly useless for most purposes for which bronze powder is applied, and, as its structure cannot be changed again, it has to be wasted. The exact time for stamping a certain material must, therefore, be very carefully ascertained and every care taken not to exceed this time.

The powder crushed in the fine stamp is now finished. A certain proportion is always too coarse, and must be sifted out.

For beating rough scrap into powder three operations are necessary. For beating either very thin sheet scrap or foil scrap into powder, the first operation in the heavy stamp is not necessary; such scrap is first cut up into very small pieces (about $\frac{1}{4}$ in. square) and put at once into the medium stamp. The succeeding stages of the process are the same as for heavy scrap.

When very fine leaf metal scrap is used it is cut up into

very small shreds, or better still torn up by special tearing devices and crushed in the fine stamp only, with the addition of about 1 per cent. of stearine.

In all cases the same final products are obtained, namely, a very fine powder with a small percentage of very fine flakes or "flitter." The next process is that of suitably grading this powder.

GRADING.

As already explained, the metal as it leaves the fine stamp contains a certain amount of fine powder and a proportion of coarser stuff. It is chiefly a matter of experience that enables the attendant to obtain a very high percentage of fine—and finest—powder with but little coarse powder. The greatest difficulty is to avoid over-stamping. If the material is left too long in the fine stamp it becomes rough, cakes together, and is therefore useless. If not stamped long enough the percentage of coarse powder may be too high, which means that after sifting the coarse material has to be stamped again, thus involving considerable waste of time and increasing the cost of production.

Generally speaking, the product of the fine stamp should contain about 80-85 per cent. fine powder and about 15-20 per cent. tailings. To separate, first of all, the fine powder from the tailings, a revolving sieve may be used (see Fig. 9). This consists of a wooden cylindrical frame, arranged horizontally, and revolving at a speed of about 60 r.p.m. The frame is covered with silk gauze of either 180 or 200 mesh to the inch. The cylinder is placed in a wooden dust-tight cover. The powder is placed in the hopper, from which it is fed automatically into the cylinder. The fine powder is collected in the two main drawers, the tailings falling into the smallest drawer. The output of such a sieve is about 30-40 lb. per hour.

The powder which has passed through 180- or 200 mesh sieves is now commercial "bronze powder," but it is suitable for cheaper grades of paint only, and does not, as a rule, fetch a very good price. It should not be forgotten that the material which has actually passed through the sieve contains a certain proportion of much finer powder. This proportion depends again on the proper working of the stamps; if the stamps are worked properly, it should contain at least 40 per cent. of the very finest grade, 30 per cent. of the second grade, and the rest only should be 200-mesh powder. It is therefore very important to grade the fine powder obtained in the 180 to 200-mesh sieve into the several finer grades. This cannot be done in an ordinary sieve, as 200-mesh silk is the finest material obtainable. For this purpose, another very ingenious device has been developed—the air separator. The principle of this apparatus is as follows:—A strong current of air (produced by a fan) acts upon a bed of the metal powder. The current is directed upward, and blows the finest particles upward, thus keeping them in suspension. The air current being strongest at the bottom (where it is produced) and weakest at the top, it is obvious that the lightest particles will rise, and the heavier the particles are the lower they will float; this fact facilitates their separation.

The air separator is shown in Fig. 10, and partly in section, Fig. 11. It consists of a wooden box with drawer, on top of which is arranged a drum of thin sheet-metal, about 7 ft. high and 2 ft. diameter. In the center of the drum there is a vertical shaft, driven by means of bevel gear and a pulley. At the bottom of the shaft is fixed a two-bladed fan. The ratio between the speed of the fan and its blade-pitch is selected so as to produce a suitably strong air current.

The powder is supplied through the door at the lower end of the drum, and deposited on the bottom just under-

neath the fan. Each charge consists of about 20-30 lb. The door is then tightly closed and the machine started. After about 15-20 minutes all the fine powder is in a state of suspension—i. e., it floats in the air-current; the finest particles are near the top of the drum, the heaviest particles remain on (or just above) the bottom of the drum. Owing to the centrifugal action of the fan, the whole material is kept near the inside of the drum walls, and very little powder remains in the center. At different heights in the interior of the drum are arranged circular-shaped troughs (A A in Fig. 11). If the fan is stopped, the powder that is kept in suspension will fall gradually into the troughs or boxes underneath, and in this way separation of the powder is obtained. The troughs are generally arranged in three positions above each other; the top box will contain the finest powder; the middle, medium fine;

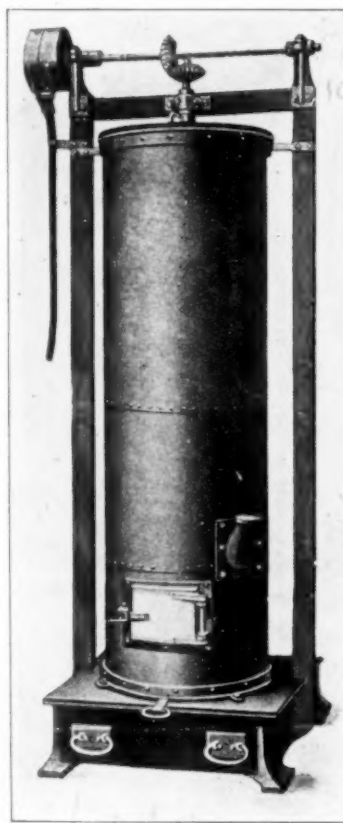


FIG. 10.—AIR SEPARATOR FOR GRADING FINE POWDER.

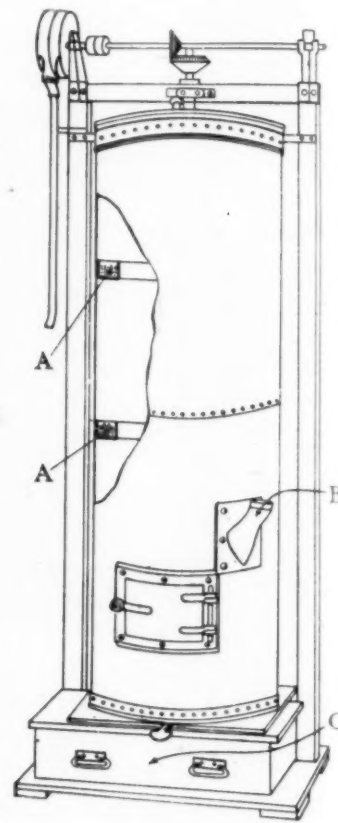


FIG. 11.—DIAGRAM OF AIR SEPARATOR.

and the lowest the coarsest powder, even this powder will, however, be finer than 200 mesh. A certain quantity of powder will either not float up at all, or will fall back to the bottom immediately the fan is stopped. In the bottom plate is arranged a slit, which normally is closed by means of a sliding cover. When all the coarse powder has settled at the bottom plate, the sliding cover is pulled out, and the powder falls into the drawer underneath. It takes generally about $\frac{3}{4}$ to 1 hour for the powder to settle; the exact time can easily be ascertained by means of the inspection hole B. This is provided with a heavy cover; when lifted, air will escape. If this still contains floating particles of metal it must be closed again. As soon as the air is free, and the powder settled, the machine may be opened. The top cover of the drum must then be lifted and the troughs removed, emptied into suitable receptacles, and replaced again. The separator is then ready for a new charge.

In this way we obtain three different grades of bronze powder: First, finest; second, medium; third, coarse bronze powder. In addition to this, by only sifting in the rotating sieve, we get a 200-mesh powder and 180-mesh powder respectively. The first three grades are fairly uniform in fineness; but the last two grades are not uniform at all—they are really a mixture of about five different grades, from the finest down to 200-mesh powder. For some purposes the latter two grades are sufficient; but there is more demand for the first three grades, and, obviously, these command much better prices. It is therefore advisable to work with separators in addition to sieves.

There will be a certain percentage of tailings left, both in the fine sieves and in the air separator. These can be collected and crushed fine in the fine stamp, or they can be sold without further crushing. These tailings are used for special purposes for decorative work, also largely in the manufacture of wall-papers, etc. If they are crushed into finer powder a small quantity of stearine should again be added, and great care must be taken, as they are easily "overstamped." They will require, as a rule, only half the

considerably reduced by these simple means, though it cannot be avoided altogether.

The difficulties in connection with carrying about the fine powder, and those arising in fixing accurately the time needed for stamping the same, have already been mentioned. In order to avoid all these troubles, the makers of the special machinery have frequently experimented with various devices. Only comparatively recently a Continental firm has succeeded in building a successful combined automatic stamping and sifting machine. This machine illustrated in Fig. 12, shows the interior and working parts.

The stamp is a circular fine stamp, similar in principle to the rough stamp, but with considerably lighter rammers. The material coming either from the rough or medium stamp is placed in the hopper K, whence it is automatically fed into the interior of the stamp. The latter is provided with a fan (not shown in the illustration), which stirs up the finer particles. These drop on to a baffle-plate N, and from there through a chute into the bottom part of a small bucket elevator. This powder, which contains a certain percentage of fine bronze powder

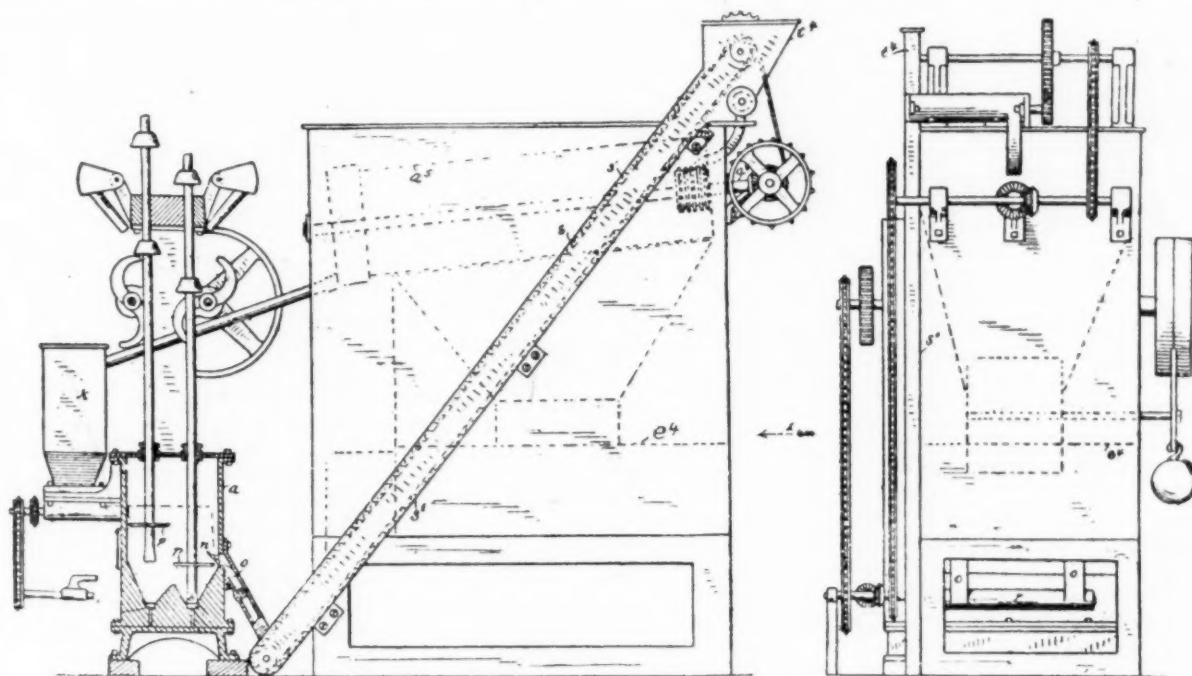


FIG. 12.—INTERIOR AND WORKING PARTS OF AUTOMATIC STAMPING AND SIFTING MACHINE.

time for stamping as the material from the medium stamps. If possible, it is best to mix them with the original "flitter" (from the medium stamp) in the proportion of 1:5.

A great difficulty in connection with grading is the dusting. Both in emptying the fine stamps and in filling and emptying the sieves, separators, etc., quantities of fine powder escape into the workshop. This is a disadvantage in several ways: The inhaling of bronze dust is unhealthy, and the loss of the very finest powder may be quite considerable if the material is handled carelessly. Later on the means for avoiding injury to the health of the workpeople will be discussed. It should, however, be pointed out that all workpeople must be instructed to take care in handling the powder. Under no condition should powder be thrown from one receptacle into another, but suitable devices should be used for shovelling the powder. In moving powder from one place to another, boxes with suitable lids should be used, and the boxes must be carried gently and steadily. The amount of dust raised can be

and a certain percentage of "flitter" is lifted into a hopper A4. From here it is again automatically fed into the cylinder of the fine sieve T5. The fine powder is sifted out into the drawer below; the coarse powder and flitter falls through a tube into the hopper K again, and is stamped once more into finer powder. Thus the whole process is perfectly automatic, and there is no danger of overstamping. It is, of course, necessary to make the whole machine absolutely air-tight, so as to prevent oxidation of the powder and escape of the finest particles.

Such an automatic plant is very suitable in cases where there is a certain amount of fine scrap of brass or similar alloys as a by-product from works. Instead of selling or otherwise disposing of this scrap, a machine can be installed which will turn the whole waste into powder that can be easily sold. There is very little attendance or skill required; it is also easier and more profitable to dispose of the powder than the scrap as the full value of a manufactured product is received.

(To be concluded.)

THE PLATINUM SHORTAGE, AND WHAT IT MEANS TO PLATINUM USERS

A DISCUSSION SUGGESTED BY THE GOVERNMENT'S CALL FOR A LARGE QUANTITY OF PLATINUM.

WRITTEN FOR THE METAL INDUSTRY BY C. M. HOKE, A.B., B.S., A.M., CONSULTING CHEMIST, THE JEWELERS' TECHNICAL ADVICE CO., NEW YORK.

One of the first actions of the government after the declaration of war was a movement to secure at once a large amount of platinum, and at the same time to suggest means of conserving this metal for increasing future demands. This has provoked much discussion among chemists, jewelers, etc., and has brought out a number of new facts. It is the purpose of this and a succeeding article to mention such points as the following: The reasons why the government needs this metal, the possible sources of it, including the stores held up in Europe, and new deposits that might prove profitable, as well as the substitutes that offer some promise, and the practical means of distinguishing these substitutes from the genuine metal.

WHY THE GOVERNMENT WANTS PLATINUM.

The most conspicuous use for large quantities of platinum industrially is in the manufacture of concentrated sulphuric acid. Large amounts of metal are used as the contact agent in the so-called contact process for sulphuric acid, and huge platinum vessels are used for concentrating it. The metal is, of course, used repeatedly, with only a very slight permanent loss. Concentrated sulphuric acid is essential in the manufacture of explosives, acids, chemicals, and directly or indirectly, of almost everything else; it may be said to be as fundamental as iron itself.

Platinum is largely used in every laboratory where research work or analyses are carried on. One-third of the whole production goes into dentistry. Electrical instruments of various kinds contain a certain amount. Photography consumes its quota. Within late years jewelry has taken a growing share of the supply. This by no means exhausts the list of uses. Hence the government's interest in the supply.

The whole enormous quantity that is employed in dentistry is practically a total loss; that is, it is never returned to the market to be refined and used again. The metal that is used in laboratories and acid manufacture is, on the contrary, almost wholly saved; the vessels, crucibles, funnels, etc., after being used for a long time are worked over and the metal used again. Most jewelry eventually finds its way back to the refiners. In the electrical field the consumption is fairly complete, as it is in photography.

SOURCES OF PLATINUM.

Russia has always supplied the world with the bulk of its platinum. Needless to say, there has been little production during the last two and a half years, and much of what was produced has been held up by one embargo or another. The prospect of the release of the masses of metal that must have been hoarded by the Russian autocracy is a most enticing one to those who require the metal now. But with conditions as they are in Russia today, May 1, 1917, it is manifestly impossible to make any prophecies whatever.

It is understood that England also has some metal on hand. Now that the United States is an ally, it is thought that this English store will soon be open to our market. France in the past did much of the refining of Russian crudes, but there is no information as to what part France can play now.

In short, while European sources may be depended

upon to yield large amounts of metal in time, it is difficult to say how long we shall have to wait. Much of the European metal is under either government control or supervision.

As to the American fields, that also is a matter of speculation, though information is being collected with great enthusiasm. It is known that there are many deposits in the United States, but many of them (black sands) are hard to work, and with platinum at \$20 or even \$40 an ounce, quite unprofitable. But with platinum at \$100 or more, certainly some of these deposits ought to pay well. Shortly we shall hear from these. At present most of the domestic platinum appears as a by-product from the electrolytic refining of copper, instead of being mined for itself.

There are large and promising deposits in Colombia, which we understand are to be worked immediately. Secretary Redfield has also instructed the agents of his department in Australia, Borneo, Tasmania, Russia, and elsewhere, to investigate possible deposits there.

On the whole, while the situation is full of the greatest uncertainty and wildest speculation, it is hopeful.

OTHER WAYS OF INCREASING THE IMMEDIATE SUPPLY.

In order to conserve the fairly large supply that is now on hand in the United States, the government is strongly urging the use of substitutes for platinum wherever feasible, and the restriction or curtailment of its use for non-essential things.

Within recent years the use of platinum in jewelry has increased enormously. Indeed, gold is scarcely used at all for high grade work. And it would seem that as the price increases the popularity increases, which really is to be expected when one considers the purposes of jewelry. The general prosperity of the country during the past year has greatly benefited the platinum jewelry industry, and increased platinum consumption. Accordingly, during the past few weeks, Secretary Redfield has held several conferences with committees of jewelers, in which they were asked to cut down, if not to discontinue, the use of platinum in jewelry.

The result of these conferences, to date, has been that the jewelers are signing a pledge to discontinue the use of the metal in all large or bulky pieces, to use gold for all hidden parts (such as scarfpin stems, ear backs, catches, etc.), and so on. This will of course aid the government in securing its immediate needs from the supply now in the hands of the dealers.

Platinum is still new enough in jewelry to seem odd to some eyes; it does not seem to them as attractive as the old-fashioned gold. Of course beauty is a matter of taste, but there are certain unquestioned advantages of platinum to make it (at least to those who handle much jewelry) quite the only metal for setting most stones, and for most other jewelry purposes. First, it does not tarnish at all. Second, its mechanical properties are such, when it is alloyed with a little iridium, that it can be made into the frailest and most delicate designs—veritable cobwebs of precious metal—that still are strong enough to stand the roughest handling. Third, in addition to being mechanically suited to holding stones in place, it improves the color

of most of them, especially diamonds, to which it lends a blue-white color that is most desirable. Fourth, being white, it is more generally becoming and harmonious than the yellow gold. If the reader will imagine how tiresome it would be to see all women, whatever their ages or complexions, wearing yellow dresses all the time, and contrast this picture with the very pleasing one of all women in costumes of white, he will understand why a white metal for jewelry has certain artistic advantages over gold.

For these reasons it is believed that platinum has a permanent place in the jewelry world, and that as soon as the country's emergency needs are satisfied, its use will continue more actively than before.

SUBSTITUTES FOR PLATINUM.

In every field that uses platinum, substitutes have been tried, and in a few cases adopted. There are dozens of substitutes for every purpose, but most of them are used reluctantly.

It is interesting to notice that where really intelligent research has been employed the results have been encouraging, and in several instances a material has been found that is actually superior to platinum and at the same time much cheaper. There are some obvious substitutes that no doubt will be more commonly used now; for example, huge silica vessels can be used for the evaporation of sulphuric and other acids, at a magnificent economy.

Base metal cores with platinum covering, either drawn on or deposited electrolytically, are being used very largely.

In laboratories, crucibles of other materials, such as silica, alundum, white gold, "rhotanium," and so on, are coming into use. There are disadvantages here, as no one of these materials will serve all purposes, so that it is necessary to have several of them to fill the place of the platinum crucible.

In jewelry it would seem that no substitute could be found. Perhaps the main reason for this is sentiment, which has a large place in jewelry. Purchasers do not want "substitutes"; they prize the pure, the genuine, and they will do without before they will purchase the unfamiliar. Moreover, a jeweler of standing feels the same way about it; he doesn't like the sound of any word that has been used at any time in connection with dishonesty. But there are other reasons beside the sentimental. For one thing, when a piece of jewelry is being made, a quantity of scrap metal accumulates; often the amount of scrap is as much as 90 per cent. of the original bar. This must be refined and remelted, and made ready for further use. It is easy enough to do this with gold, and within the last few years the jewelers have learned to perform these operations on platinum. But the introduction of even one new metal into a factory greatly complicates the processes of refining, and especially of remelting, and so adds largely to the expense of manufacture.

The only substitute that shows any prospect of success in jewelry is 18-k white gold, consisting of gold and a platinum-group metal. It is strikingly like platinum in looks and working qualities, does not tarnish, resists nitric acid, and has the great advantage of coming under the stamping laws. It is in many ways an excellent jewelry metal, but its use is not large.

Since, as has been said, dentistry uses about a third of the whole platinum output, and since only a fraction of the metal ever comes back into use again, this field is the one in which substitutes are most important.

Also, since poor as well as rich have teeth that need care, it is a genuine social service to reduce the cost of dentistry. For some years now very valuable information has been accumulating, chiefly from the Case School of Applied Science, at Cleveland, where Dr. Frank A. Fahrenwald and others have been working under the auspices of the Research Fund of the American Dental Association. They have found materials which they declare to be actually superior to platinum and platinum-iridium for certain purposes. In many respects their work on alloys is very encouraging and stimulating. They recommend certain alloys of palladium with silver, or with gold, and for stiff metal to be used for the very important pins that fasten porcelain teeth to their backing, they recommend a tungsten pin coated with palladium or a palladium alloy. These coated tungsten pins are extraordinarily stiff, of high melting point, are not affected by the acids of the mouth, take solder readily, have the proper coefficient of expansion, and are relatively cheap. It is unfortunate that while tungsten is common enough in nature, its use is greatly restricted by the fact that its manufacture is practically controlled by the General Electric Company, either by patents or secret processes. It is always regrettable for a valuable material to be kept out of use by a private monopoly.

Dr. Fahrenwald also states that palladium is "a particularly promising element for our purpose." An alloy of considerable interest that consists of metals of high specific gravity, is "rhotanium," used for crucibles and other laboratory ware. In some respects it is superior to platinum, which it greatly resembles. It costs about the same per gram, but as its specific gravity is less, a definite saving is effected.

In connection with dentistry, platinum-clad base metal pins must be mentioned; also pins that are partly platinum and partly steel, and pins made of alloys of platinum with gold and other metals.

In electricity the use of platinum has been decreasing. Tungsten and other metals are replacing platinum for contact points. Nichrome, nickel steel, and various other combinations of base metals are being used with platinum covers. Refiners continue to buy tiny platinum wires from electric light bulbs, but these are from old style instruments.

A glance at these instances, which by no means exhaust the list of substitutes, will show how necessary it is for a buyer of old platinum to be on guard. In addition to the spurious metal that is offered intentionally, there is much that is offered in good faith; for example, the general public does not know that platinum is being supplanted in the electrical field, and makes many honest mistakes.

METHODS OF DETECTING SUBSTITUTES.

When a large piece of metal is offered for sale as platinum, the trickery to look for is the simple scheme of coating a piece of 18-k gold, or the like, with a heavy coat of platinum. A test of the specific gravity will reveal this, but the smaller buyers of old metal apparently do not make these tests, and every now and then we read of such a swindle as this. Boring suspicious bars is always in order, of course, for the gold brick man is still abroad in the land.

Jewelry is traditionally tested by means of nitric acid. Platinum is absolutely unaffected. Unfortunately the commonest platinum substitute, 18 and 19-k white gold, is also unaffected, as are alloys that contain a fair amount of platinum.

For that reason, platinum jewelry should be tested with aqua regia. The best way is to rub it against a

touchstone (a piece of smooth, fine-grained black basalt) until you have a shining streak of metal. Beside this make a similar streak with some unquestioned platinum. Cover both streaks with a drop of aqua regia. A very bad imitation will dissolve at once, giving off fumes and probably turning green. Let the acid act for about a minute or more, if no action is visible at once, and then wipe the stone gently with a soft rag. The platinum streak will be affected very slightly; it may be hard to detect any change. But other metals will either dissolve entirely, or will show some other change. Eighteen karat white gold dissolves fairly promptly. Nickel and some other base metals dissolve slowly; alloys containing considerable platinum and a small amount of base metal are the only things that are apt to deceive.

It must be understood that this testing requires some experience. A person must make a good many tests with known metals before it is safe for him to pronounce on unknowns.

Julius Wodiska, a prominent jeweler, has recently offered the trade a formula for an aqua regia solution that has been found satisfactory. It readily detects spurious metals, especially if they are rubbed upon a stone, as above. The formula consists of:

Hydrochloric acid, c. p. 1 1/4 ounce Troy.
Nitric acid, c. p. 3/4 " "
Potassium nitrate, powder. 1/20 " "

It seems odd to give the proportions in Troy ounces, until it is remembered that all jewelers have these weights, and may not have any others. The mixture is made up in a three or four (fluid) ounce bottle, and left to stand uncorked for some hours before using, while the excess chlorine escapes.

It must be remembered that while the action of this solution on platinum is very slow, it is measurable, and if platinum is left to soak either in it, or any other combination of nitric and hydrochloric acids, some of the metal will dissolve.

A few experiments were made to demonstrate this. Some metals were drawn down to 10/1000 inch, all through the same die, so that they would all be the same size. Then equal lengths (2 inches), were cut off, weighed, immersed in the above solution for a stated time, and then removed and weighed again. The two pieces of gold were left in only ten minutes; the platinum, four hours.

Kind of metal	Original weight in milligrams.	Loss in milligrams.
14-k yellow gold.....	32.90	3.75
19-k white gold	29.15	4.10
3% iridio-platinum	53.30	1.48
10% iridio-platinum	53.10	0.60

It will be observed that the platinum lost less in four hours than the gold lost in ten minutes. But it will also be seen that even in an experiment on a two-inch piece of very fine wire, the loss was enough to weigh.

The fact that platinum differs from most metals in that it dissolves without changing its appearance, is what has led the unobservant to think there was no action at all.

When testing materials other than jewelry or bars, such as a mass of filings, or dental pins, it is impossible to test each tiny piece separately. The practice is first to boil the stuff in nitric acid, which will dissolve silver, palladium and its silver alloys, nickel and its alloys, etc., and will discolor certain other metals. The material that resists nitric acid is then treated

with aqua regia. Gold, including white gold, will dissolve promptly, 18-k green gold will not dissolve, but will change color. A small amount of real platinum, if any is present, will be dissolved also.

These two treatments will reveal all of the substitutes that might be found, with these exceptions: Base metal coated with platinum, and platinum that is alloyed with small amounts of other metals. A common alloy that will escape detection is one containing 70 per cent platinum, plus iridium and palladium.

As for the base metal coated with platinum, this can often be found with the magnet. If not, and if the pieces are in the form of small pins, the chances are that they will be mistaken for all-platinum.

The matter will be settled quite definitely only when the metal is melted. Any substitute reveals itself instantly under the oxy-gas flame to an eye that has had a little experience. For that reason it is becoming customary for buyers of old platinum to subject material to the flame before accepting it. If nickel or copper is present, the metal will darken and show foreign matter quite unmistakably. Copper turns the flame green. Iron sputters and flies out of the crucible in tiny sparkles. Silver chloride and gold, which are impurities very common in filings, are revealed first by a characteristic smell from the chloride, and by stains in the crucible. Silver leaves a dark stain, and gold leaves a film of metallic gold whose color ranges from purple to bronze, according to its thickness. Nickel leaves a black color in the crucible, molybdenum a bright blue. Palladium and iridium show themselves as a bright mirror of metal on the upper part of the crucible.

(To Be Continued.)

ROYAL COPPER FINISH.

The most successful method for this finish is as follows:

First, cleanse and polish the copper surface free from grease in the usual manner; second, plate in a solution of lead to obtain a very thin coating of lead to protect the copper from oxidization during the heat treatment. The lead solution should consist of the following:

Water 1 gallon
Caustic soda..... 4 ounces
Sugar of lead..... 1 ounce

Use the solution warm and with two to four volts. Plate the copper articles until a very thin coat of lead is produced; third, remove, wash and dry as usual; fourth, immerse in a molten solution of potassium or sodium nitrate heated in an iron crucible to 700 or 800 degrees Fahr. until a reddish black coating of oxide of copper is produced; fifth, cool in kerosene or paraffin oil; sixth, polish upon a soft buff, using gold rouge mixed with denatured alcohol as the polishing medium.

The lead deposit can be dispensed with if so desired, but concerns producing the royal copper finish have decided the method is the best as a more uniform surface free from imperfections is produced.—C. H. P.

THE NEW MEXICO LAUNCHED.

Another super-dreadnought was added to the United States Navy when the battleship "New Mexico" was launched successfully from the Brooklyn Navy Yard, at ten o'clock Monday morning, April 23, 1917. The "New Mexico" is the first warship of her type to be operated by electric drive.

WAR MATERIAL FOR ORNAMENTS

ARTISTIC AND USEFUL ARTICLES MANUFACTURED FROM 18 POUND SHRAPNEL SHELLS.

WRITTEN FOR THE METAL INDUSTRY BY P. W. BLAIR, MECHANICAL SUPERINTENDENT.

The large amount of shrapnel shells and other component parts manufactured in the United States and Canada within the past two and a half years reached to enormous figures. The close inspection that these shells and parts receive at the hands of the different inspectors at the plants before they can be accepted has been the cause of the rejection of a large percent-

them on the market at a reasonable price, the following articles have been devised.

Fig. 1. A complete shell with cast brass ornamental base and flower pot holder mounted on a time fuse and serving as a pedestal table and holder all in one.

Fig. 2. Shell body fully equipped and used as a table and reading lamp. On each side of the lamp the time fuse parts are also shown.



FIG. 1.—COMPLETE SHELL MOUNTED ON TIME FUSE AND USED AS A FLOWER POT HOLDER.

age. A considerable time and expense of material has been expended on the manufacture of these shells that cannot be used for war purposes, ways and means to conserve them have been adopted by some concerns by manufacturing them into useful and ornamental articles, and after several months of designing and detail work in order that there would be a demand for

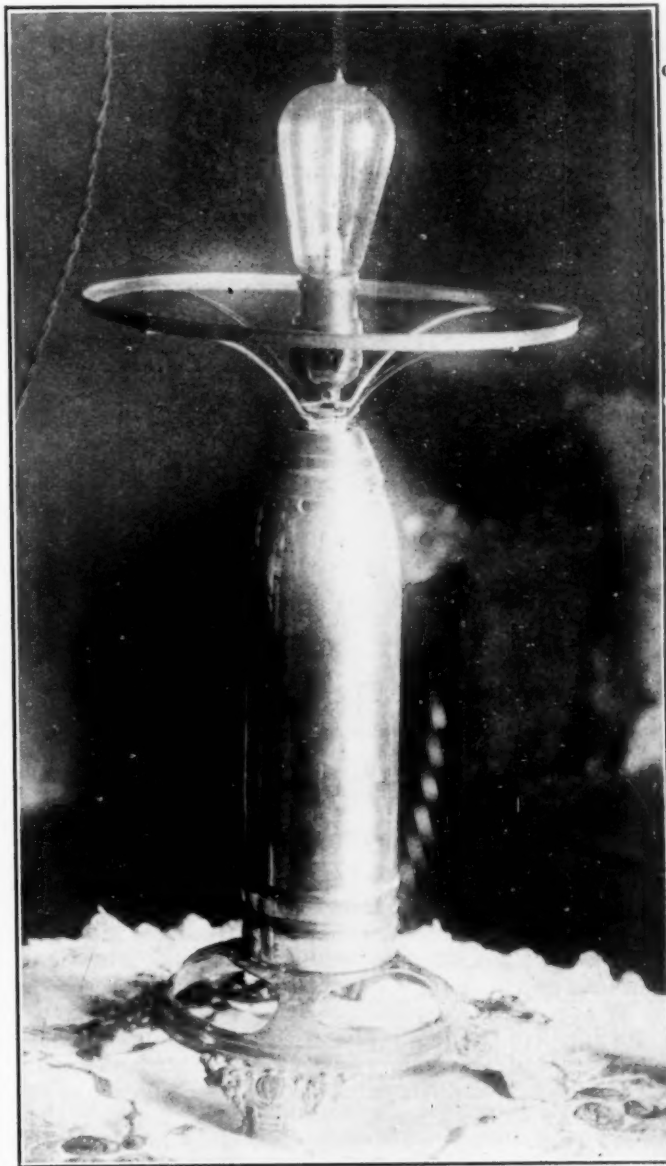


FIG. 2.—SHELL BODY FULLY EQUIPPED AND USED AS A TABLE READING LAMP.

Many other useful articles have also been designed and these include pin cushions, clip holders and desk weights, which are made by sawing the base of the shell at the bottom and leaving a receptacle therein.

These articles are highly finished in silver nickel and oxidize or antique, as the purchasers desire, and it can be seen that these deadly instruments of war can also be applied to useful as well as ornamental purposes and so serve humanity at large.

LOSSES IN METAL FINISHING

SOME SUGGESTIONS AS TO HOW THEY MAY BE OVERCOME.

WRITTEN FOR THE METAL INDUSTRY BY F. E. HALBERT, SAN FRANCISCO, CAL.

In the writer's opinion there is scarcely a jobbing or manufacturing plant in the country where there are not a number of ways in which there are losses daily that could be easily remedied. The most noticeable is the loss of polishing material through the use of improper, or rather, unadaptable wheels to the work in hand. The second big item is the loss of time and material due to the wheels being not properly cared for.

The biggest mistake that employers usually make is that they think that their plant is well equipped with all necessary materials. The majority of employers carry the idea that as long as a workman can get along without some asked-for equipment or material, that he does not need it, when the fact is that he is losing money by not carrying out his employee's suggestions. The writer could name a number of plants both East and West, where this has occurred. This is more noticeable in establishments where the men employed are paid on a piece-work basis. In two shops in par-



A REFRESHMENT SET AND WAITER MADE FROM COPPER AND BRASS PARTS OF AN 18 POUND SHRAPNEL SHELL.

ticular, the superintendent apparently had the idea that his men were trying to beat the firm on all possible occasions. This was far from the truth.

The writer once applied for employment at a manufacturing plant and in reply to the usual questions as to wages and previous employment stated the last place employed and the rate of pay earned there. The superintendent then said, "Well, if you could make that rate there you can make the same here"; with that remark he directed me to the foreman. After a few moments conversation with that individual, who seemed to be well informed, he began to apologize for his polishing room equipment and further stated that he had tried to induce his superior to add to it, but thus far had failed to interest him.

After one glance around I decided I did not want the position and so informed the foreman. This is what was observed: Polishing wheels too small and few in number which required re-setting up and using again within a few hours, meanwhile being dried in an oven thereby killing the strength of the glue. This

not only caused a big loss of polishing materials, but a more rapid deterioration of the fibre of the wheels also; the outer layers showing a burnt condition. In addition to all this, the polisher's efficiency was vastly reduced. On inquiry, I was told that the men never made more than \$15 per week; whereas at the prices paid they should, with up-to-date equipment, have been earning \$20 per week or even more; and doing the work at a less cost per unit of finished product. In addition to the other handicaps a cumbersome system was followed of having work done in "sets"; another instance of the failure of theory and practice working in harmony. About the only commendable thing observed there was that a different glue brush was used for each size of emery.

While the above was an extreme case, the writer has found the faults enumerated (and some others) prevalent in a greater or less degree in nearly all polishing plants worked in or visited, from the province of Nova Scotia in eastern Canada to the Pacific Coast cities of the United States, during a period of over twenty years.

Another point overlooked by the employer and also by many polishers is the weakening of the fibre of the wheel itself due to long use and other causes. It is the usual custom to use a wheel as long as it is of sufficient size for the work in hand. Just as a rope will give way under long continued strain, just so will a polishing wheel grow weaker under the strain of centrifugal force and vibration. This is especially true of wheels of cotton disks if of soft weaves.

We can agree with other writers on this subject that a polishing wheel should dry, away from artificial heat for 48 hours. While a wheel may work well after 24 hours drying in fair weather in a fairly dry climate, yet a longer period is desirable.

The writer's observations have led him to believe that the greatest mistake that polishers themselves make in using their wheels is to use them too long, or rather, until they are too thoroughly worn down before setting up. If used too long, the coating left, if any, is apt to be loose and uneven, resulting in a reduced amount of work the next time the wheel is placed in use. The writer has observed as much as a 50 per cent. difference in the amount of polishing material used by different men in the same shop. This of course refers to shops where each man is given a set of wheels, and he alone uses them. In shops where a day rate wage system prevails and one is allowed to put on any wheel in the shop that may not be in use at the time, we have found conditions to be even worse.

The condition of the polishing lathe itself does not receive the attention in most plants that it should. The rapid wearing out of the bearings due to a constantly varying load, grit in the bearings and neglect, cause much loss, for a poor lathe may waste as much material as a poor workman. In how many polishing plants does one find a regular inspection of the machinery by a competent machinist? There are other considerations to be taken into account than those enumerated above but these are the main items.

ESTIMATED ALUMINUM PRODUCTION.

The aluminum output of the United States this year may reach 100,000,000 pounds, or about half the world's production.

EQUIPPING A POLISHING DEPARTMENT

SOME PRACTICAL ADVICE FROM A PRACTICAL POLISHER.

WRITTEN FOR THE METAL INDUSTRY BY P. A. WHEELER.

In equipment of a polishing department incidental to an expanding or new business, the item of initial expense is too often the chief consideration. While the writer would not advocate the buying of anything the salesman might offer in this line, yet we find that the idea that most anything will do is apt to rule the situation; or, perhaps, one will more often hear the remark, "That seems to be a good thing, but cannot we get along without it?"

Where the amount of capital available is strictly limited then the situation must be studied with much care. The kind and amount of work to be turned out must first be taken note of. Next, what equipment can be installed that will turn out the work at a profitable figure.

To turn out work at the highest rate of profit often requires the investment of considerable capital. Here is where the services of a practical mechanic comes into the reckoning. Often manufacturers will pattern such a department after that of some concern in a different line, with the result that it is found some of the equipment is not wholly adapted to the work to be done.

The writer knows of one plant in particular where the polishing and plating rooms were built according to the ideas of the owner, with the result that the lighting arrangements were very bad. There was plenty of light but it was wrongly placed, resulting in loss of time, or rather increased labor cost. To have changed the position of the lighting (overhead) would have cost several hundred dollars.

Again, one of the polishing lathes was far too heavy and therefore too expensive for any work required of it. One machine was speeded too high causing loss of material without any corresponding gain in output.

The first thing to be considered is adaptability of polishing wheels to the work in hand; (a) kind of wheels; (b) size. There is a wide range in choice here both in material of which it is made and the density or manner of making.

Right here is where a snag may be encountered in the choice of different wheels by different mechanics, even for the same kind of work. This may be accounted for in the main, by the fact that there has been in the past no standardized methods. A polisher will usually want the kind of wheels he may be most familiar with. No hard and fast rules can be laid down, for each plant presents its own individual requirements, which may differ from other plants in the same line of business. Yet again, some polishing wheels are adaptable to a great variety of work of form or material. Others to one kind of work and that only. The writer has tried three kinds of paper wheels on different work and has failed to find any class of work that these wheels are better adapted to than any other wheel.

The subject is too broad to be treated at length here, but if any manufacturer wishes to consult me at any time I will be glad to have him do so.

I believe, generally speaking from the standpoint of experience, that in the majority of plants, a larger wheel than that generally used would be of advantage. The question of speed at which the wheels may be run would be the determining factor. The larger wheels present more of the action of a plane, thereby insuring accuracy and greater output; while if the speed is too high, centrifugal force would tend to loosen the abrasive and to injure the wheel in other ways. On the other hand, a wheel too small loses its coating by the work digging in to it more readily. This is more noticeable where the pieces to be polished have carving designs or other un-

equal surfaces which present more or less sharp edges.

In observing many polishing plants both east and west, the writer has noted that in a great many instances the lathes used were too light even for the wheels used. The constantly varying load and the frequently shifting balance require a stiff heavy machine to properly stand the strain. Conversely, a lathe heavy enough for the work in hand will not only save material by keeping the wheel in better balance, but on account of there being less vibration is much less fatigue to the polisher. Few employers realize the importance of this.

The writer cannot speak with authority on the merits of motor-lathes and would like to hear from some foreman operating them as to expense of operation and repairs. I have found, however, that lathes connected by a belt to individual motors which are protected from dust, etc., are very satisfactory.

The question of automatic polishing and plating machinery is adapted only to the manufacturer producing large quantities of small work, or pieces of even, straight forms. This phase of the subject is being handled in a capable manner by other writers.

SMOKE FINISH ON BRASS OR BRONZE.

The true smoke black finish is produced by coating brass or bronze with a thin coating of turpentine copal varnish or hard oil finish. After which the articles are allowed to dry for a day and then a smoke black is applied by the aid of a torch flame, using turpentine as the medium to produce the flame. Kerosene oil may be used or a portable gas flame, the idea being to produce a black smoke which readily combines with the thin coating of varnish under the influence of the heat of the flame. By this method parts of the articles may be coated black and other parts may be left the natural color of the metal. After the smoked parts become dry they may be toned down by canton flannel and a little beeswax. In place of the turpentine varnish a lacquer may be used for the surface coat and the best lacquer for this purpose consists of the following:

White French varnish.....	1	part
Fusel oil.....	2	parts

Apply this lacquer by brushing, dipping or spraying.

Plating solutions for smoke finishes may be prepared by using a dilute copper cyanide solution as follows:

Water	1	gallon
Sodium cyanide.....	1 1/4	ounces
Copper cyanide.....	1	ounce
Voltage.....	2 to 2 1/2	

Then add arsenic dissolved in caustic soda in sufficient quantities to produce a smoky black and use copper anodes. The arsenic solution should be prepared by dissolving 1 pound of caustic soda and 1 pound white arsenic in 1 quart of water by the aid of heat. About 1 ounce of the combined mixture per gallon of copper solution should give good results.

A solution prepared as follows will also give a black smoke effect:

Water	1	gallon
Double nickel salts.....	8	ounces
Ammonium sulphocyanide.....	2	ounces
Copper sulphate.....	1	ounce

The voltage used should be 1/2 to 1 volt and nickel or iron anodes.

C. H. P.

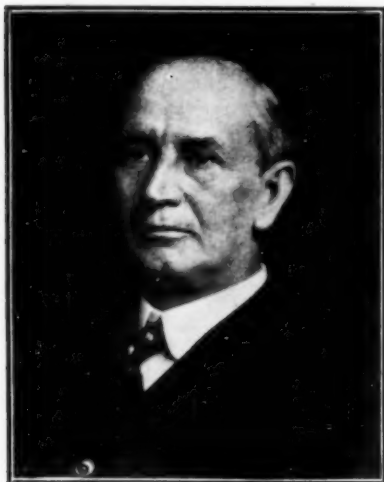
FIVE MEMBERS OF THE GOVERNMENT METALS COMMITTEE

MEN PROMINENT IN METAL MANUFACTURING TO AID THE UNITED STATES.

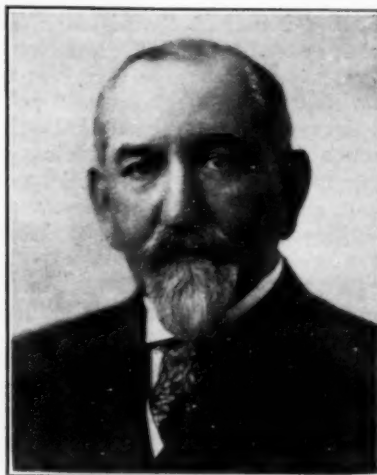
To deal with problems of brass and aluminum supply for the army and navy, the Council of National Defence on April 7, 1917, created two committees to act in conjunction with the raw materials committee of

Janney, Steinmetz & Company, Philadelphia, Pa.

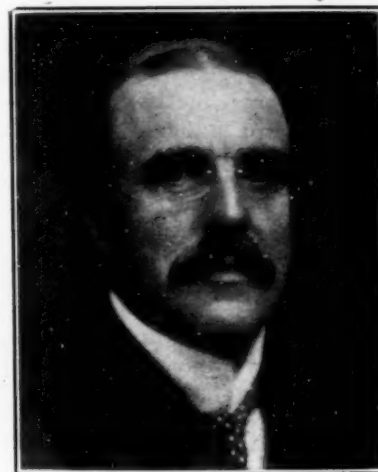
The members of these committees include, as will be seen from the photographs and also from the lists published above, some of the men controlling the largest



CHAUNCEY P. GOSS
President of Scovill Manufacturing Company, Watertown, Conn.



CHARLES F. BROOKER
President American Brass Company, Waterbury, Conn.



FREDERICK J. KINGSBURY
President Bridgeport Brass Company, Bridgeport, Conn.

the civilian advisory commission which acts with the Council. The two new committees are expected to bring highly valuable technical information to the army and navy. Committees relating to other raw

metal producing plants in the world. The brass men, Messrs. Brooker, Goss, Jones, Kingsbury and Hazelton, represent probably over three-quarters of all of the brass produced in this country. Of the aluminum men, Mr.



LEWIS H. JONES
President of Detroit Copper and Brass Company, Detroit, Mich.



ARTHUR V. DAVIS
President of the Aluminum Company of America, Pittsburgh, Pa.

materials vital to the conduct of the war are being formed and will be announced later. The two committees announced follow:

Brass—Charles F. Brooker, American Brass Company, Waterbury, Conn.; C. P. Goss, Scovill Manufacturing Company, Waterbury, Conn.; Lewis H. Jones, Detroit Copper & Brass Company, Detroit, Mich.; Barton Hazelton, Rome Brass Company, Rome, N. Y.; F. J. Kingsbury, Bridgeport Brass Company, Bridgeport, Conn.

Aluminum—Arthur V. Davis, Aluminum Company of America, New York; E. E. Allyné, Aluminum Castings Company, Cleveland, O.; Joseph A. Janney,

Davis is the president of the only aluminum producing company in the United States, a company which last year produced nearly 100,000,000 pounds; while Messrs. Allyné and Janney represent the largest interests in the manufacture of aluminum alloys in the form of castings, etc.

It is to be taken for granted that the personnel of the committees on other war materials will be of the same high calibre and importance. By means of these committees the Government of the United States will be enabled to work intelligently and thus avoid many of the mistakes that Great Britain made at the start of the war.

EDITORIAL

Vol. 15

NEW YORK, MAY, 1917

No. 5

THE METAL INDUSTRY

With Which Are Incorporated
**THE ALUMINUM WORLD, THE BRASS FOUNDER
 AND FINISHER, THE ELECTRO-PLATERS'**
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THE WAR AND METALS

The world war into which the United States has now entered has been most appropriately called a "war of metals." At the present outlook the nation or nations having the largest supply of metals of all kinds will win the war always excepting, of course, the part that sufficient supplies of foodstuffs will necessarily play. The United States, by her entrance into the war, places at the disposal of the Entente the dominating supply of metals.

The production of the United States of the metals most needed in modern warfare: iron, steel, copper, zinc and aluminum, leads the world, and this production is about to be exercised to the fullest power in defence of the nation and to the attainment of world peace. With a production last year by the United States of 41,000,000 tons of steel, 2,000,000,000 pounds of copper, 60,000 tons of spelter and probably over 100,000,000 pounds of aluminum and with every evidence of these figures being exceeded this year we can realize what help this country can give to the Allies and why they have so cordially welcomed the entrance of the United States into the tremendous fight against autocracy.

While it might be thought that now we are in the war the flow of war materials, explosives and munitions, etc., that has been going to the Allies might be checked, competent authorities state that the mushroom-like factories that have sprung into being all over the United States can supply all the shells and munitions that our own navy and army will need and we will still be able to pour an unending stream into the battle fields on the other side of the Atlantic.

While the part of chemistry in prosecuting successful warfare of modern days has been and is fully recognized it is now the art of metallurgy that has been mobilized and particularly so in the manufacture of the copper alloys so necessary to the production of war material. A visit to any of our large copper and brass plants will show what importance is attached to metallurgy today. Trained men in carefully organized departments are busily engaged in developing new alloys and methods of their production, in the elimination of wastes and the reduction of production costs. Nothing is overlooked, the product of every run of furnace and of mill is carefully tested and extreme measures are taken to ensure that a perfect metal or alloy as the case may be is being turned out. In this connection the United States Government has made a most happy selection in the formation of the Metals Committee as an aid to the Council of National Defence. As will be seen from the list published on another page of this issue of THE METAL INDUSTRY this committee is composed of the most prominent men in the metal business comprising both east and west. The aid that this committee, composed of men who control some of the largest and most highly organized copper and brass plants of the country, can give and are willing to give cannot be over-estimated.

PROCLAMATION BY THE PRESIDENT TO THE PEOPLE

My Fellow-Countrymen:

The entrance of our own beloved country into the grim and terrible war for democracy and human rights which has shaken the world creates so many problems of national life and action which call for immediate consideration and settlement that I hope you will permit me to address to you a few words of earnest counsel and appeal with regard to them.

We are rapidly putting our navy upon an effective war footing and are about to create and equip a great army, but these are the simplest parts of the great task to which we have addressed ourselves. There is not a single selfish element, so far as I can see, in the cause we are fighting for. We are fighting for what we believe and wish to be the rights of mankind and for the future peace and security of the world. To do this great thing worthily and successfully we must devote ourselves to the service without regard to profit or material advantage and with an energy and intelligence that will rise to the level of the enterprise itself. We must realize to the full how great the task is and how many changes, how many kinds and elements of capacity and service and self-sacrifice it involves.

These, then, are the things we must do, and do well, besides fighting—the things without which mere fighting would be fruitless:

We must supply abundant food for ourselves and for our armies and our seamen, not only, but also for a large part of the nations with whom we have now made common cause, in whose support and by whose sides we shall be fighting.

We must supply ships by the hundreds out of our shipyards to carry to the other side of the sea, submarines or no submarines, what will every day be needed there, and abundant materials out of our fields and our mines and our factories with which not only to clothe and equip our own forces on land and sea, but also to clothe and support our people, for whom the gallant fellows under arms can no longer work; to help clothe and equip the armies with which we are co-operating in Europe, and to keep the looms and manufactories there in raw material; coal to keep the fires going in ships at sea and in the furnaces of hundreds of factories across the sea; steel out of which to make arms and ammunition both here and there; rails for wornout railways back of the fighting fronts; locomotives and rolling stock to take the place of those every day going to pieces; mules, horses, cattle for labor and for military service; everything with which the people of England and France and Italy and Russia have usually supplied themselves, but cannot now afford the men, the materials, or the machinery to make.

It is evident to every thinking man that our industries, on the farms, in the shipyards, in the mines, in the factories, must be made more prolific and more efficient than ever, and that they must be more economically managed and better adapted to the particular requirements of our task than they have been; and what I want to say is that the men and the women who devote their thought and their energy to these

things will be serving the country and conducting the fight for peace and freedom just as truly and just as effectively as the men on the battlefield or in the trenches. The industrial forces of the country, men and women alike, will be a great national, a great international service army—a notable and honored host engaged in the service of the nation and the world, the efficient friends and saviors of free men everywhere. Thousands, nay, hundreds of thousands, of men otherwise liable to military service will of right and of necessity be excused from that service and assigned to the fundamental sustaining work of the fields and factories and mines, and they will be as much part of the great patriotic forces of the nation as the men under fire.

I take the liberty, therefore, of addressing this word to the farmers of the country and to all who work on the farms: The supreme need of our own nation and of the nations with which we are co-operating is an abundance of supplies, and especially of foodstuffs. The importance of an adequate food supply, especially for the present year, is superlative. Without abundant food, alike for the armies and the peoples now at war, the whole great enterprise upon which we have embarked will break down and fail. The world's food reserves are low. Not only during the present emergency, but for some time after peace shall have come, both our own people and a large proportion of the people of Europe must rely upon the harvests in America.

Upon the farmers of this country, therefore, in large measure rests the fate of the war and the fate of the nations. May the nation not count upon them to omit no step that will increase the production of their land or that will bring about the most effectual co-operation in the sale and distribution of their products? The time is short. It is of the most imperative importance that everything possible be done, and done immediately, to make sure of larger harvests. I call upon young men and old alike and upon the able-bodied boys of the land to accept and act upon this duty—to turn in hosts to the farms and make certain that no pains and no labor is lacking in this great matter.

I particularly appeal to the farmers of the South to plant abundant foodstuffs, as well as cotton. They can show their patriotism in no better or more convincing way than by resisting the great temptation of the present price of cotton and helping, helping upon a great scale, to feed the nation and the peoples everywhere who are fighting for their liberties and for our own. The variety of their crops will be the visible measure of their comprehension of their national duty.

The Government of the United States and the Governments of the several States stand ready to co-operate. They will do everything possible to assist farmers in securing an adequate supply of seed, an adequate force of laborers when they are most needed, at harvest time, and the means of expediting shipments of fertilizers and farm machinery, as well as of the crops themselves when harvested. The course of

trade shall be as unhampered as it is possible to make it, and there shall be no unwarranted manipulation of the nation's food supply by those who handle it on its way to the consumer. This is our opportunity to demonstrate the efficiency of a great democracy, and we shall not fall short of it!

This let me say to the middlemen of every sort, whether they are handling our foodstuffs or our raw materials of manufacture or the products of our mills and factories: The eyes of the country will be especially upon you. This is your opportunity for signal service, efficient and disinterested. The country expects you, as it expects all others, to forego unusual profits, organize and expedite shipments of supplies of every kind, but especially of food, with an eye to the service you are rendering and, in the spirit of those who enlist in the ranks, for their people, not for themselves. I shall confidently expect you to deserve and win the confidence of people of every sort and station.

To the men who run the railways of the country, whether they be managers or operative employees, let me say that the railways are the arteries of the nation's life and that upon them rests the immense responsibility of seeing to it that those arteries suffer no obstruction of any kind, no inefficiency or slackened power. To the merchant let me suggest the motto, "Small profits and quick service," and to the shipbuilder the thought that the life of the war depends upon him. The food and the war supplies must be carried across the seas, no matter how many ships are sent to the bottom. The places of those that go down must be supplied, and supplied at once. To the miner let me say that he stands where the farmer does: The work of the world waits on him. If he slackens or fails, armies and statesmen are helpless. He also is enlisted in the great Service Army. The manufacturer does not need to be told, I hope, that the nation looks to him to speed and perfect every process; and I only want to remind his employees that their service is absolutely indispensable and is counted on by every man who loves the country and its liberties.

Let me suggest, also, that every one who creates or cultivates a garden helps, and helps greatly, to solve the problem of the feeding of the nations; and that every housewife who practices strict economy puts herself in the ranks of those who serve the nation. This is the time for America to correct her unpardonable fault of wastefulness and extravagance. Let every man and every woman assume the duty of careful, provident use and expenditure as a public duty, as a dictate of patriotism which no one can now expect ever to be excused or forgiven for ignoring.

In the hope that this statement of the needs of the nation and of the world in this hour of supreme crisis may stimulate those to whom it comes and remind all who need reminder of the solemn duties of a time such as the world has never seen before, I beg that all editors and publishers everywhere will give as prominent publication, and as wide circulation as possible to this appeal. I venture to suggest, also, to all advertising agencies that they would perhaps render a very substantial and timely service to the country if they would give it widespread repetition. And I hope that clergymen will not think the theme of it an un-

NEW LINCOLN STATUE



A new presentment of Abraham Lincoln in bronze by Sculptor George Gray Barnard, donated to the City of Cincinnati, Ohio, by Mr. and Mrs. Charles P. Taft, is of bronze and massive in size. It weighs between three and four tons and is valued at \$100,000.

worthy or inappropriate subject of comment and homily from their pulpits.

The supreme test of the nation has come. We must all speak, act, and serve together!

WOODROW WILSON.

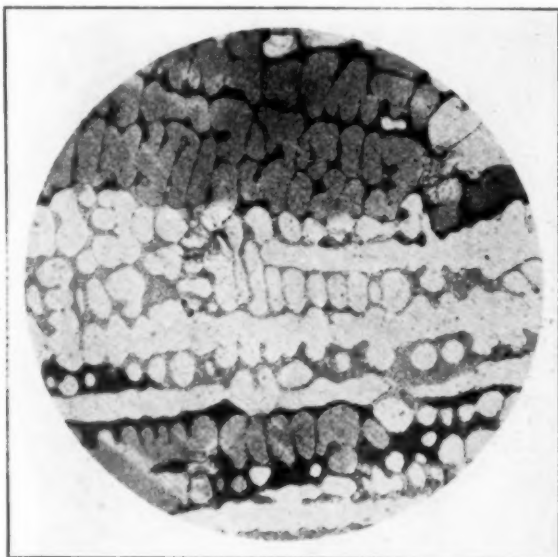
CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

BORON COPPER PRODUCTS

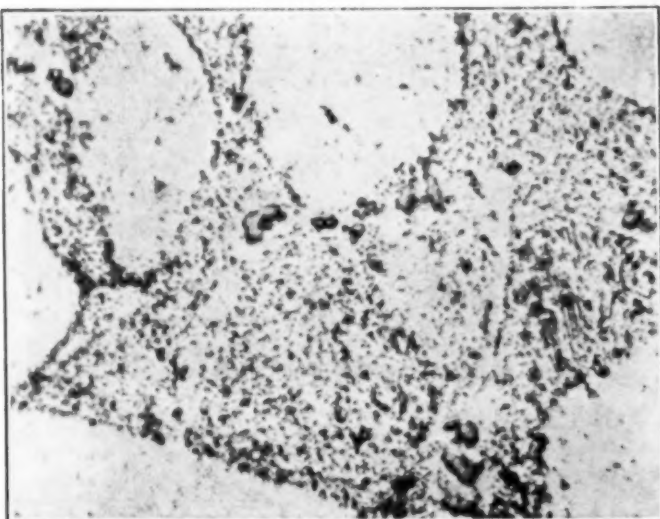
TO THE EDITOR OF THE METAL INDUSTRY.

In response to your call for a discussion of the subject of "Boronized Copper" or "Boron-Copper," I submit two photomicrographs which I made of a sample of this material, taken at different magnifications (as noted in the cuts) after etching with ammonia and hydrogen-peroxide. These photos show as much of the oxide eutectic as I have ever seen in any sample of copper.



BORON COPPER MAGNIFIED 100 DIAMETERS.

The presence of so much oxide would of course indicate that this material cannot be of any use as a deoxidizer. Furthermore it would seem extremely unlikely that any boron could have come in contact with it, for in that case the oxide should at least have been reduced in quantity; and before the boron could



THE SAME COPPER MAGNIFIED 700 DIAMETERS.

be effective in deoxidizing copper to which this material might be added, it would certainly have to deoxidize the material itself. We have looked for boron in this material by chemical analysis

without result, and have also found it of no value as a deoxidizer or flux.

GEO. F. COMSTOCK, Metallurgist, Bronze Dept.
The Titanium Alloy Manufacturing Company,
Niagara Falls, N. Y.

April 16, 1917.

TO THE EDITOR OF THE METAL INDUSTRY:

Replying to your letter of April 10, regarding material sold by the American Boron Products Company, we tried this material in our experimental foundry and could not see that it affected the copper in any way. This naturally led us to believe that the product did not do what is claimed in its advertising. As we already had a very efficient deoxidizer for copper and its products we were not interested to carry the matter further.

Niagara Falls, April 13, 1917.

W. M. CORSE,
Manager Bronze Dept.,
Titanium Alloys Manufacturing Company.

TO THE EDITOR OF THE METAL INDUSTRY.

Your letter of April 10 duly received and in answer thereto beg to inform you that I have used both boron copper and boron copper alloy (BCA), as manufactured by The American Boron Products Company of Reading, Pa.

I conducted several experiments using boron copper as a deoxidizer for pure copper, also for a copper base alloy carrying 15% of lead and in neither case did I find any benefit whatever derived therefrom.

These results being highly unsatisfactory I conducted similar experiments with both the pure copper and the copper base alloy, using boron copper alloy (BCA) in place of boron copper; while the results obtained in this case seemed to be somewhat of an improvement, yet they were not sufficiently so as to produce perfectly sound castings.

The percentage of boron copper and boron copper alloy (BCA) in these experiments was varied from 2% to 5% and used in strict accordance with written instructions I had previously received from the American Boron Products Company.

In conclusion I have to advise that from the results of my experiments I am of the opinion that boron copper has little or no merit as a deoxidizer for pure copper or copper base alloys and particularly is this true with copper base alloys similar to the one I used in my experiments.

On the other hand, however, boron copper alloy (BCA) does seem to have better qualities as a deoxidizer in some classes of red metal, but not to the extent that I would consider it as a general flux for our class of work.

N. H. SCHWENK, Metallurgist.
William Cramp and Sons Ship and Engine Building Company,
Philadelphia, Pa.

April 19, 1917.

TO THE EDITOR OF THE METAL INDUSTRY.

We notice with a great deal of interest the controversy between the "Pro-Borons" and the "Anti-Borons" regarding the metallurgical properties of "Boronized Copper." As to the chemical affinity and alloys of boron and its compounds with copper, the claims as represented by the American Boron Products Company as quite "homeopathic" in conception, and not in accordance with any well known authorities or tests which have been experienced in metallurgy. The advertisement as appearing in THE METAL INDUSTRY of the American Boron Products Company stated that the boronized copper contains 99.85% copper with occluded boronized gas, representing a balance of .15% content. Copper has a high coefficient of expansion and contraction.

Cooling from 1,981° F. or above its melting point, the contraction of metal alone, the mechanical exertion from the internal stresses would force any appreciable percentage of occluded gas from the melt.

Metallic boron melts at 3,992° F. and has an atomic weight of 11. In molten condition, if the requisite amount of metallic boron was plunged into molten copper, considering high melting point of boron and consequent gravitation upward through the copper, owing to the high viscosity of any of the molten alkali earths, the time element would be lacking to form copper borates. The boron would form a skin on the top of the melt and oxidize to B_2O_3 . A double melt of copper and boron would be necessary to mix homogeneously a slight percentage of boron with the copper.

Would this pay?

In event that copper borates would not be formed and $Cu_{100}B_x$ formed, our experience with aluminum-copper using boron, the aluminum precipitated the boron which segregates graphitoidally rendering the alloy crystalline and brittle in spots.

As to the use of the boric oxide B_2O_3 , a brittle, glassy substance,

it volatilizes at a red heat, the fume of which can be condensed the same as arsenic or antimony oxides, therefore, it would be impossible to occlude, as a gas.

In examining the boronized copper alloy, turnings were dissolved and after precipitating the copper, a flame test was tried for boron without success.

We cannot see from the statements made in the advertisement of American Boron Products Company where any profit could be realized on the sale of the alloy if the copper boron required any metallurgical treatment. As the spread between the selling price against similar copper alloys on the market would not warrant sufficient margin of profit if any appreciable amount of any other metal was added to the alloy.

We are not "agin 'em" and perhaps the American Boron Products Company are hiding some metallurgical result from the world and disguising their product under the name of boron copper. Cook and Perry both claim the North Pole.

J. M. GOLDMAN.

The H. G. Chemical Products Company,
Cleveland, Ohio.

April 11, 1917.

THE MANUFACTURER'S ANSWER TO THE CRITICS

TO THE EDITOR OF THE METAL INDUSTRY:

Answering "VERITAS" (in your April issue): On general principles we prefer to attend to our growing, successful (and to ourselves), perfectly satisfactory business, to taking any note of an unknown; we have no time to spend on those who are not patriotic (?) enough to show their colors with their face and name.

THE METAL INDUSTRY has sufficiently answered your very apparently prejudiced criticism IN ADVANCE. No doubt Mr. Scott got you a-going. Mr. Scott dissected the products of this company, which we are marketing through Messrs. Edward Le Bas & Company, of London, and it was without any solicitation on our part that Mr. Scott secured the boronic products from Le Bas & Company, and, after the most careful analysis of those products, he wrote the highly "scientific" article which appeared in the January issue of the London edition of THE METAL INDUSTRY, and which was then reprinted in the American edition in March. One would suppose you would "ask" Mr. Scott, who apparently knows, to enlighten you, possibly quite as well as the ones you "ask" through THE METAL INDUSTRY.

Mr. "VERITAS," after you have come out in the open, we may decide to tell you a few interesting things, or ask you to "ask" THE METAL INDUSTRY.

Answering Dr. Weintraub: The most "scientific" argument in favor of the products marketed by American Boron Products Company, Inc., is their repeat orders of ton lots, which they ship to the largest manufacturing companies in this and foreign countries. After having made careful, practical tests of our products, and thereupon giving us their repeat orders, the many customers of sufficient standing, as recorded on our books, are the best answer to any criticism any laboratory or any scientific authority dare make, so far as we are concerned.

Mr. R. A. Wood, the well known publisher of the "Waterbury Book of Alloys," of Cheshire, Conn., whose works are well known to THE METAL INDUSTRY (in fact are sold by THE METAL INDUSTRY), wanted to know something about boronic products. He has never received a dollar of pay from us for the report he gave on our No. 3 product (boronic-copper alloy), and with which number he personally did the work recorded in our ad. in the March issue of THE METAL INDUSTRY.

The fact that our boronic-copper (No. 2 of our list) is being used where phosphor, silicon and manganese coppers cannot be used, beats all the arguments in the world that emanate from biased or prejudiced professional sources. We certainly do respect the great and worthy men of the world, who, through science and scientific research, made possible what we and others are doing in the metal world today, but we have also come to respect the man at the melting pot, and his advice to the purchasing agent and his (the purchasing agent's) call on us for our products.

With us (the assailed company) the man at the melting pot and the purchasing agent are the "scientific" "conclusion of the matter."

Answering all other critics: It is in place for us to say

that we welcome honest criticism, and even the criticisms of those who are not strictly honest in their aims if it will result in perfecting all our products to where even our critics may see the new light and use some or all of them, but we have "stated the case"—we are too busy to discuss this matter with those who may not want to be convinced.

It is also proper to announce here to our critics that all that is interesting and worth knowing about boronic products is not recorded in the archives of the patent and research departments at Washington, D. C.

AMERICAN BORON PRODUCTS COMPANY, INC.

Reading, Pa., May 1, 1917.

NEW BOOKS

The Founders' Manual. By David W. Payne. Size, 5 x 8 inches. 676 pages and 245 illustrations. Bound in limp leather. Published by D. Van Nostrand Company. Price, \$4.00. For sale by THE METAL INDUSTRY.

This little booklet is a refreshing departure from the usual style of foundrymen's handbook in that it contains a vast wealth of information presented by data which has taken many years of actual experience to collect. The compilation of this matter, together with authoritative instructions for the solution of the many problems which continually confront the metal worker, all properly arranged for ready reference, will meet with a most favorable reception by all who are interested in or connected with foundry work.

Journal of the Institute of Metals. Volume 15, No. 2, 1916. Size, 6 x 8½ inches. 392 pages, including index. Bound in cloth. Edited by the secretary, G. Shaw Scott. Published by the Institute of Metals. Price, \$5.00.

Among the many valuable communications recorded in the Journal is one on "The Development of the Spelter Industry," by E. A. Smith, of Sheffield, England, who goes very exhaustively into the vital question of zinc and the war and the need for ensuring in the future that this metal is handled entirely by Britishers within the British Empire. A very full discussion of Mr. Smith's paper is recorded; this should be read along with the paper by those interested in this all-important subject. The Journal also includes a verbatim account of Professor W. H. Bragg's fascinating May lecture on "X-rays and crystal structure, with special reference to certain metals," the printing of which has been eagerly awaited by many metal workers, engineers and physicists desirous of following the latest conception of the structure of metals as revealed by the x-rays.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical

PETER W. BLAIR, Mechanical

CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—I have an inquiry for a lot of work specifying Tobin bronze with an elongation of 20 per cent., and as I am not familiar with this metal would like to know what composition would have to be used to get these results.

I also have an inquiry from the same source for a lot of work requiring metals of 28,000, 35,000, 45,000 and 60,000 tensile strength, respectively, and would like to have your idea and advice as to what would be the most appropriate mixtures to use to get these results. The work is to be used on gun carriages, and the party does not specify any particular mixture to be used, but does require that the metals come up to the above mentioned tensile strength tests.

If you can give me some information concerning the above it will be a help to me in figuring on the work.

A.—Tobin bronze is an alloy that is used for rolling or forging only. When not rolled it has a high elastic limit, tensile strength and hardness. A slight amount of cold rolling will much increase these qualities. An elongation in 2 inches of 30 per cent. may be expected in rods $1\frac{1}{4}$ inches diameter and larger, and 20 per cent. in rods smaller than $1\frac{1}{4}$ inches in diameter. A tensile strength of 60,000 pounds per square inch may be obtained in rods not larger than 1 inch, and 50,000 pounds in rods larger than 3 inches. This material is supplied in rods, plates, sheets, bars and seamless tubing.

Manganese bronze is the alloy generally used for sand castings that must give 60,000 pounds tensile strength. For this strength in rolled articles naval brass may be specified with an elongation of 25 per cent. in 2 inches. Its composition is copper 59 to 63, tin .5 to 1.5, and zinc remainder.

Muntz metal, which runs copper 59 to 62 per cent., zinc 39 to 41 per cent., and lead .6 per cent maximum, may be used for castings that must have 45,000 pounds tensile and 20 per cent. elongation, although manganese bronze is easier to handle in the brass foundry.

Gun bronze of copper 87 to 89 per cent., tin 9 to 11 per cent., and zinc 1 to 3 per cent., will give 35,000 pounds tensile strength, although 30,000 pounds and 15 per cent. elongation is more generally required.

Commercial yellow brass with copper 64 to 68 per cent., zinc 32 to 34 per cent., and lead 3 per cent. maximum, will give 28,000 pounds tensile and 15 per cent. elongation in castings, although 2 or 3 per cent. of tin is desirable, also on account of its improving casting qualities.—J. L. J. Problem 2,433.

ANALYZING

Q.—I have several rolls of silver stock, some are fine silver and some are sterling. How can I tell the difference without having each roll analyzed?

A.—Cut a small piece from each roll and dissolve them in separate glasses of nitric acid. The pieces cut from the sterling rolls will yield a light green solution. The fine silver yields a pearl white solution. A few drops of ammonia added to the dissolved silver will make the contrast in colors more pronounced.—O. A. H. Problem 2,434.

CASTING

Q.—I cast a soft metal force composed of lead hardened with antimony on to iron dies, and sometimes desire to fill up temporary sinkings in the iron dies. If the sinkings are deep and vertical, clay will generally hold in them, but even then it is not satisfactory as the dampness generates steam. Where the sinkings are shallow the clay will not resist the pressure, but

leaves the iron die and rises to the surface of the molten metal. Could you give me a composition that would either adhere to or by gravity remain on the iron and not be forced to the surface of the molten metal, and yet that could easily be cleaned off the iron die afterward?

A.—It is suggested that instead of clay alone a mixture of molding sand with a small amount of clay be used. It could be tempered with water containing a little water glass. This would act as a bond, and if the mixture was baked on, it ought to resist the lifting action of the molten metal and yet not generate any steam.

The cement known as "Cementum" adheres well. It consists of barium sulphate, and the bond is a very small amount of potassium and sodium silicates. This cement if baked well ought not to generate any steam.

In some situations no composition may prove satisfactory, as in the case of a broad shallow depression. It ought to be possible to make a plaster cast of such a place and using it as a pattern make an iron casting that could be silver soldered or brazed into place. This could afterward be removed by heating with a blow torch until the solder melted and the insert then lifted out.—J. L. J. Problem 2,435.

COLORING

Q.—We have an order for sterling silver spoons to be finished with French gray handles, roman bowls. We sand blast the bowls, then color in a fine gold solution, but the color is very dead and stained. Scratch brushing seems to help some, but it removes the gold. Is there some special gold solution for this class of work?

A.—In order to obtain a clean snappy roman color the bowls should be sand blasted and given a quick dip in a hot fire stain dip composed of

Nitric acid	2 parts
Hot water	1 part

before the handles are finished. After the handles are finished the bowls should be brushed with a brass or German silver scratch brush, then given a light flash color in a 14-kt. gold solution, then finished roman in the fine gold solution. If the handles are finished before the bowls are acid dipped the fumes will destroy the finish, and if the bowls are colored roman before the handles are grayed off the pumice used for graying is liable to scratch the roman finish.—O. A. H. Problem 2,436.

DEPOSITING

Q.—How may we deposit lead on sheet copper?

A.—There are many formulas in existence for lead plating, but the simplest ones are those made up from caustic soda and litharge (yellow oxide of lead). These solutions give fairly good results:

Water	1 gallon
Caustic soda	8 ounces
Litharge	2 ounces
Corn syrup	$\frac{1}{8}$ ounce

Temperature 110 degrees and 2 to 3 volts.

For heavy plating the lead acetate baths give excellent results:

Water	1 gallon
Lead acetate	1 pound
Ammonium acetate	6 ounces
Glacial acetic acid	2 to 3 ounces
Gum arabic	$\frac{1}{8}$ ounce

Temperature normal and 2 to 3 volts. The anodes for the acetate solution should be enclosed in cheese-cloth bags.—C. H. P. Problem 2,437.

FINISHING

Q.—Can you tell me how a tan finish is obtained on copper?

A.—Tan or terra cotta finish upon copper is produced in the following manner: Copper plate the brass or steel parts in the usual manner, then scratch brush lightly while wet and give them a cyanide dip. Afterwards immerse in the following solution for a few moments or until the tan color develops.

Water (boiling).....	1 gallon
Chlorate of potash.....	6 ounces
Single nickel salts.....	3 ounces
Sulphate of copper.....	1¼ pounds

After the desired finish is obtained remove the articles, wash, dry and dry scratch brush, if necessary, on a soft brass wire scratch brush. C. H. P. Problem 2,438.

MACHINING

Q.—We have received an order for brass nipples to be made from ½ I. P. size brass pipe, and would like to have you give us the definition of what nipples are.

A.—A close nipple has no shoulder, and is about twice the length of a standard pipe thread. A shoulder nipple is of any length, and it derives its name from the shoulder or blank space left between the two threads. A sub-nipple is a substitute nipple; or, in other words, a short pipe with different threads on each end.

A long screw nipple is made up of a short length of pipe, one end having a standard I. P. thread, and the other is threaded straight and far enough to allow a coupling and lock-nut to screw on by hand. Under the specifications of a pipe nipple it is under 12 inches in length. Pipe over that length is referred to as cut pipe.—P. W. B. Problem 2,439.

MELTING

Q.—We have been requested to melt for a society an accumulation of old silver, consisting of coins, watch cases and trinkets which they desire run into ingots, which will be sent east to a bell foundry. We wish to know the approximate temperature that will be required for this melting, also whether a common crucible such as used in ordinary bronze foundry practice would do, or if some special crucible would be required?

A.—If you do not wish to attempt to refine the accumulation of old silver, but merely melt to pour into ingots, all you have to do is to use the ordinary graphite crucible in either a coal or coke fired furnace, or you may melt it in a gas or oil operated furnace. This latter form of furnace is the best, because then none of the silver will be lost in the ashes. The temperature required for silver will be in the neighborhood of 1,000 degrees Centigrade or 1,832 degrees Fahrenheit, and all that you will need to use in the way of a flux will be a little burnt borax sprinkled on top of the metal.

Of course, if the metal needs to be refined this is quite a metallurgical operation, and we think had better be left to the persons going to make the final castings. But for the mere melting down of your mixture the only thing you need to observe are the ordinary precautions just the same as though you were melting copper, being careful not to overheat the metal, and also do not leave it in the fire any longer than to get it just nicely melted.—K. Problem 2,440.

METALLIZING

Q.—Can you advise why metallized work on plaster paris should turn from brown to black after staining in a liver of sulphur solution which has been toned down with burnt umber and turpentine? The articles are lacquered after being finished.

A.—It is somewhat difficult to answer this question. It appears that the umber has some darkening influence upon the copper. To prove whether this is so or not proceed in the regular manner as far as coloring with liver of sulphur then give a thin coat of lacquer, when dry apply the burnt umber, relieve as usual and then lacquer again. This test will prove whether the umber causes the trouble.—C. H. P. Problem 2,441.

POLISHING

Q.—We have a large quantity of small steel stampings to be polished before nickel plating. We understand this work can be done successfully in a grinding barrel and we are conducting an experiment at this time and have fitted up a thirty gallon barrel to run 12 R. P. M. We wish to know if this speed is satisfactory and what is the best material to use in with the work for grinding the pieces smooth on the surface and also on the edges and also approximately the number of hours required for finishing one lot of work.

A.—We do not believe 12 R. P. M. will be sufficient, 20 or even 30 will give better results and the increased friction created by the increased speed will shorten the time of the operation. An excellent material that is being used extensively in the middle west as an abrasive for such purposes is a silica sand stone. This material is the chippings from large quarries. The material crumbles readily and is as high as 98 per cent. in silica. The use of this material in connection with water and some carbonate of soda as a cleansing medium and to prevent rusting will be found very effective. A second tumbling could be given the stampings after the burrs have been removed and a smooth surface produced.

When tumbling the second time to obtain a smoother surface 120 alundum, a little sodium carbonate, some cyanide and water should be used. The final finish might also be accomplished by using the alundum dry instead of wet. The stampings would have to be dried out if the dry alundum is used in the second tumbling.—C. H. P. Problem 2,442.

SEPARATING

Q.—Can you give us any suggestion as to a process for separating aluminum from zinc when the material that they appear in is in the form of shavings, 90 parts aluminum and 10 parts zinc?

A.—Shavings of this composition could be utilized without separating by adding them to the zinc used in hot galvanizing. Firms that do hot galvanizing add small amounts of aluminum to the molten zinc in order to precipitate the dross and give a brighter coating of zinc on the articles galvanized.

If it is necessary to separate the zinc from the aluminum, the fact that zinc is brittle and may be easily pulverized when heated above 200 degrees C. might be utilized and the mixed shavings might be heated above this temperature in an iron mortar and then pounded.

Another method of separating aluminum from zinc could be based on the ready solubility of zinc in sulphuric acid. No aluminum would dissolve as long as any zinc remained unacted upon. The aluminum could be washed, dried and melted down while the zinc sulphate could be utilized as such or electrolyzed with the production of electrolytic zinc.

As zinc boils at 930 degrees C. and aluminum at about 1600 degrees C. an approximate separation could no doubt be effected by placing the mixed shavings in a retort and distilling off the zinc.—J. L. J. Problem 2,443.

RECOVERING

Q.—We have a silver chloride which we have thrown down with nitric acid from a cyanide strip. The chloride shows a green color whereas it should be white, though we have washed it a good many times. Can you advise us what to do?

A.—The greenish tone of the silver chloride thrown down from a cyanide strip denotes that it contains copper. We would suggest that you rewash the silver chloride with a solution of muriatic acid, using equal parts of acid and water, using heat. The acid will absorb the copper and hold in solution. Then rewash as usual.

If muriatic acid had been used instead of common salt in reducing to a chloride the copper would have gone into solution. A dilute solution of aqua ammonia would also absorb the copper, forming an ammonia copper in solution. After using ammonia wash the silver chloride again several times.—C. H. P. Problem 2,444.

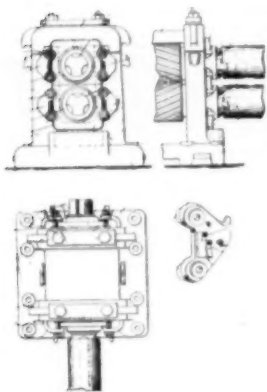
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,221,043. April 3, 1917. **Housing for Rolling Mills.** J. B. George, Worcester, Mass., assignor to Morgan Construction Company, of the same place.

The present invention relates to the construction of a pinion housing designed to contain the pinions used for driving the rolls of a rolling mill, as shown in cut, and has particular reference to the provision of suitable devices for retaining the bearings for such pinions in position, and at the same time affording a means for facilitating the disengagement of the pinions from their connections with the rolls, in order to permit the removal of the bearings and the pinions from the housing.

The patent covers: The combination with a housing, of a bearing supported therein, a retaining device for said bearing adapted when in position to contact with said bearing at two points and with said housing at a single point, whereby to provide a three-point engagement for said device, and means disposed intermediate the points of contact with said housing and bearing respectively for restraining said device against movement away from said housing.



1,221,397. April 3, 1917. **Method of Metal Plating.** E. L. Watrous, Des Moines, Iowa, assignor to E. L. Watrous Galvanizing Company of South Dakota.

The object of this invention is to provide an improved method of plating metal such as iron with non-corrosive metal such as zinc in a smooth and uniform manner so that articles such as bolts and nuts may be thus plated and the plating material thus applied will not interfere with the accurate fitting of the nuts on the bolts.

The invention consists in the arrangement and combination of the various steps of the process by which the objects contemplated are attained, and as shown in the cut.

In carrying out the process it is desirable that the vessel containing the articles to be coated be transferred quickly from the furnace in which they are treated to the zinc bath to the machine in which the centrifugal action is applied. For, if the articles to be treated become chilled during the transfer or during the time they are being placed in the centrifugal machine, the coating will become hardened either wholly or in part and thus prevent the superfluous coating material from being discharged. It is also desirable that the rotatable plate on which the vessel containing the articles to be coated is placed be heated in such a manner as to prevent chilling during the time the centrifugal action is being applied.

1,221,046. April 3, 1917. **Chemical Primer for Zinc.** J. H. Gravell, of Philadelphia, Pa.

This invention relates to depositing adherent coatings on zinc.

The object of the invention is the formation of an adherent non-metallic coating on zinc, for decorative purposes and for

the purpose of acting as a binding surface between the metal and a covering of paint.

The admixture of phosphoric and nitric acids forms a good combination, although the inventor does not wish to limit himself to the use of nitric acid, as he may use sulfuric acid or even hydrochloric acid. The best solvent for commercial purposes is alcohol, as this tends to remove any oil which may happen to be on the material under treatment and which, if not removed, prevents the action of the acids.

Although the proportions of the acids used may vary considerable he has found that six parts of the mineral acid to eight parts of phosphoric acid (ortho-phosphoric acid) form a very suitable combination when dissolved in fifty parts of water or alcohol. All these proportions are by volume and the acids are of strong commercial strength.

This admixture produces a white adherent coating resembling stone, which is suitable for protecting the metal from the action of the weather, or for decorative purposes or for holding a covering of paint or stain. The coating produced holds firmly to the surface and may be burnished without causing it to detach itself from the surface of the metal.

1,221,441. April 3, 1917. **Cleaning Metals and Preventing Them from Corroding.** J. H. Gravell, Philadelphia, Pa.

This invention relates to cleaning metals, especially steel, and its object is to clean steel so that it will not rust or metal so that it will not corrode. The invention will be described in connection with steel, but its use is not limited to that metal.

The inventor says:

"It has been proposed to use phosphoric acid for this purpose, but that material is entirely too expensive for rough commercial work, and its use has been restricted to fine classes of products, such as steel furniture and automobile bodies. The material I use, however, is very inexpensive and is not prohibited by its cost from being applied to rough castings, hot rolled steel and the like. To make a chemical bath according to my invention, I use approximately seventeen pounds of hydrocalcium phosphate to ten gallons of water and raise the temperature of this bath to the boiling point and immerse the material to be cleaned in the bath for about fifteen minutes. All these proportions and the time I allow the bath to act on the work are approximate, as the bath will act quicker if I make it stronger and the time taken to clean the work naturally depends on how corroded or dirty the work is."

1,221,735. April 3, 1917. **Process of Pickling Metal Articles.** A. F. Hoffman and Wm. M. Parkin, Pittsburgh, Pa.

The present invention relates to pickling metal articles, for example, iron, steel and the like, either castings, wrought metal or any other variety of metal, and has particular reference to the preparation of iron and steel for coating with tin, zinc, enamel or the like.

It has been the custom for many years to pickle iron and steel in a bath of dilute sulfuric or hydrochloric acids, or acid salts. In this pickling operation, there is a considerable amount of spray formed, perhaps by the escape of small bubbles of hydrogen from the surface of the pickling bath, aided by the heating of the bath, and this spray has been found to not only waste the acid, but also to be injurious to the floors or walls of the buildings, the workmen and metal stock with which it may come into contact.

It has been found that by the use of a material capable of producing a heavy blanket of foam upon the surface of the pickle liquor, the formation of spray or mist is avoided. A material suitable in many respects for the production of such a foam is sulfite waste liquor, produced by boiling wood in a

solution of calcium bisulfite in the manufacture of wood pulp according to the so-called "sulfite process." The liquor as it comes from the digester, after the separation of the wood pulp, is found to contain, however, materials which act deleteriously, by the production of a coating of the surface of the metal articles, which coating prevents the ready adhesion of tin or zinc to the iron. The inventors have found that this objection can be overcome by any treatment of the waste sulfite liquor which is capable of removing at least the major portion of sulfurous acid, under which term they include not only free sulfurous acid, but that which is in the form of sulfite or bisulfite.

1,221,769. April 3, 1917. **Alloy.** Hugh S. Cooper, Cleveland, Ohio, assignor to the Cooper Company, of the same place.

This invention consists of an alloy of zirconium and nickel or cobalt, with or without the addition of another metal.

Where a small percentage of zirconium is used, for example 2 to 10 per cent., and the balance nickel, the alloy takes a fine and lasting cutting edge and is suitable for knives, razors and other cutlery. In an alloy of zirconium and nickel comprising 8 per cent. to 15 per cent. of zirconium and the remaining per cent. nickel or cobalt, the melting point of the alloy is decreased below that of nickel, or about 1,400 C., and the electrical resistance increased compared with nickel, while an increase in hardness and resistance to oxidation and corrosion is also effected. Cutlery made of the alloy remains bright and clean even under the action of acids found in such fruits as lemons, oranges, etc., and cutting tools or implements made therefrom are far superior to steel tools. The alloy may be forged or worked at red heat, and is also applicable to electrical uses.

1,222,158. April 10, 1917. **Aluminum Soldering Compound.** C. A. Stewart, Carson City, Nevada.

The present invention relates to new and useful improvements in metallurgy and has particular reference to an improved soldering composition, the same being particularly designed for the purpose of uniting aluminum, this being at the present time one of the most difficult soldering processes to successfully be performed.

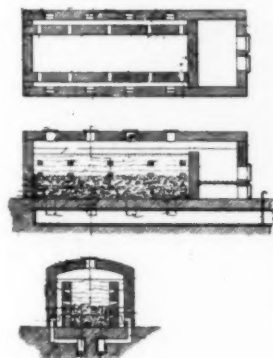
The principal object of the invention is to provide a soldering compound for aluminum, the compound being composed of a new alloy of proportionally associated metallic substances.

Referring more specifically to the compound of the invention the same consists of a homogeneous mass of metal built up of tin, lead, zinc and silver all combined in the following proportions, which are preferable:

Tin	69.07 parts.
Lead	28.77 parts.
Zinc	1.44 parts.
Silver72 parts.

1,222,793. April 17, 1917. **Method of Annealing Articles.** A. L. Pollard, of Batavia, N. Y.

This invention relates to a method of annealing castings of iron or similar material so as to render the same soft or malleable.



In carrying out this improved process the heating of the casting or similar articles along with the protective material is effected by charging the castings into the oven, as shown in cut, together with a comparatively thin layer of protecting material over the same while the furnace is under fire or being heated. Inasmuch as the castings at this time are separated from the heating agent by a thin layer of protecting material the heat is able to penetrate this protecting material and reach the castings and heat them to the

proper extent in a comparatively short time suitable for rendering the same soft or malleable. In most cases the time

required for heating the castings while protected by a thin layer of mill scale, slag or similar material, is about two hours. After this the heating agent is cut off and the oven is permitted to cool down slowly in the usual manner, being usually from about two days to about one week, depending upon the character and size of the castings which are being annealed.

1,223,001. April 17, 1917. **Alloy Bearing.** H. K. Sandell, Chicago, Ill., assignor to H. S. Mills, of the same place.

The invention relates to certain improvements in journals, or bearings. More particularly, the invention is concerned with a metallic alloy which is peculiarly advantageous in such uses, exhibiting as it does in actual practice the properties of low frictional resistance and long life.

The alloy in question consists of copper and antimony, in substantially the proportion of two parts (by weight) of the former, to one part of the latter, together with a smaller proportion of lead, and preferably in addition thereto a percentage of nickel.

The patent covers:

1. A bearing comprising substantially 50 per cent. of copper, 25 per cent. of antimony and proportionate amounts of lead and nickel.

2. A bearing formed of an alloy comprising relatively large proportions of copper, antimony and an additional constituent which will increase the tensile strength.

3. A bearing formed of an alloy consisting of four parts (by weight) of copper, two parts of antimony, one part of nickel, and one part of lead.

1,223,282. April 17, 1917. **Method of Making Tubes.** W. E. Hughes, Philadelphia, Pa.

This invention relates to certain improvements in the process of manufacturing tubes of iron, steel, brass, copper or other metal, and in the mechanism, as shown in the cut, for carrying out said process.



One object of the invention is to improve the process of making seamless metallic tubes.

A further object of the invention is to roll the tube flush on a mandrel as a core in a single heat.

A still further object of the invention is to use a mandrel of a uniform diameter throughout, which is the form on which the tube is produced.

A further object is to produce tubes of a uniform diameter or tapered as desired.

One method which may be used to withdraw the tube from the mandrel is to hammer or tap the tube longitudinally at x , or longitudinally and circumferentially, with sufficient force to produce an enlargement or buckle in the tube at one side, as shown in the drawings. This causes the tube to draw away from the mandrel at this point. Then, by rolling the tube laterally, the buckle is carried around it, which causes the tube to be slightly enlarged so that the mandrel can be withdrawn. This enlargement is almost imperceptible, yet is sufficient to free the mandrel.

1,223,458. April 24, 1917. **Composition for Filling Joints in Metallic Bodies.** J. D. White, of Toronto, Ontario, Canada.

One object of this invention is the provision of a composition designed to take the place of solder in filling the joints of metallic articles so as to prevent the leakage of liquid through the joints.

The inventor claims:

1. A material for closing joints or seams between metallic parts containing equal quantities of finely powdered whiting, finely powdered alum, and varnish.

2. A material for closing joints or seams between metallic parts containing equal quantities of finely powdered alum, and whiting, varnish, and finely powdered aluminum.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

BUDA ELECTRIC TRUCKS

The illustrations show the electric trucks manufactured by the Buda Company, Chicago, Ill., for use in factories, foundries and other industrial plants. These trucks are being used in a great many manufacturing plants throughout the United States and the manufacturers report universal satisfaction wherever they have been tried.

The manufacturers state that the mechanical construction of the trucks embody a great number of features that go to make

fitted to the shafts. The spur gears and pinions are also accurately machine cut.

The electrical equipment of these trucks is claimed to be the best that money can buy, a General Electric motor enclosed vehicle type is used. This motor is series wound and is mounted in a forged steel motor cradle and is easily accessible. The trucks have three forwarding and three reversing speeds ranging from one to seven miles per hour and the trucks are entirely reversible.



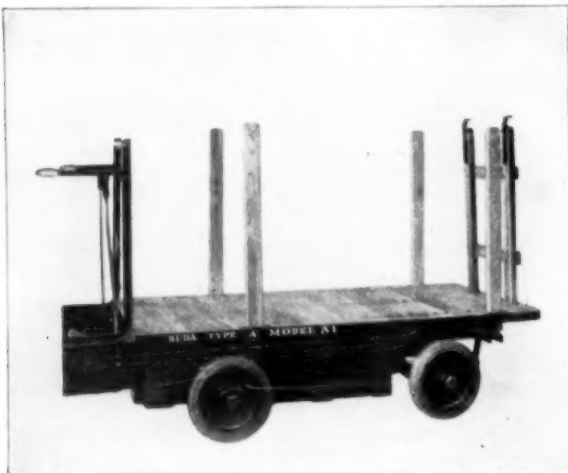
BUDA TYPE TW TRACTOR.



BUDA TYPE C ELECTRIC TRUCK.

up an all around serviceable and economically operating vehicle. Some of the points about the makeup of these trucks that may be mentioned include the Timken-David Brown worm and worm gear used in conjunction with a full floating rear axle. The wearing parts of the transmission are (1) the worms which are made of special nickel alloy steel and (2) the worm gear which

The trucks shown in this article, together with a number of others of different types, including the Buda electric truck Type C, which is known as a four-wheel steer, the Buda electric truck Type CE and the Buda electric truck Type TW-1, or three wheel type, are most adequately illustrated and described in a new loose-leaf catalogue just issued by the Buda Company. The



BUDA TYPE "A" TRUCK.



BUDA TYPE CE ELEVATING TRUCK.

is made of phosphor bronze. These gears are encased in a dust-proof housing and operate continually in a bath of lubricating oil.

In the case of the differential gears and pinions these parts are all case-hardened heat-treated steel machine cut and closely

greater part of this catalogue is made up of a series of photographs which constitutes pictures without words as to the serviceability and adaptability of the Buda trucks, there being a truck for each and every operation that is met with in the various phases of industrial activity along manufacturing lines.

BUCKEYE FOUNDRY APPARATUS

No doubt a number of our readers have heard of the Buckeye heater or Buckeye portable oil burner, but may not be familiar with its varied uses. The small cut, Fig. 1, shows the heater in the act of skin-drying molds, which can be done in a remarkably short space of time, thereby saving time and labor. This heater burner is constructed from a solid steel drawn pipe and



FIG. 1.—BUCKEYE SKIN DRIER.

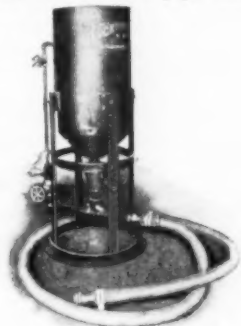


FIG. 2.—SAND BLAST HOSE MACHINE.

is the only oil burner that will keep ignited when the hood is taken off, showing perfect atomization. An oil burner is not properly designed that has not perfect atomization, as that would cause imperfect combustion, and the Buckeye is the only burner depending on centrifugal action for atomization, which in practice has proved to be superior to any other.

Another valuable outfit to have around the shop is the Buckeye oxy-acetylene welding and cutting plant. Fig. 3

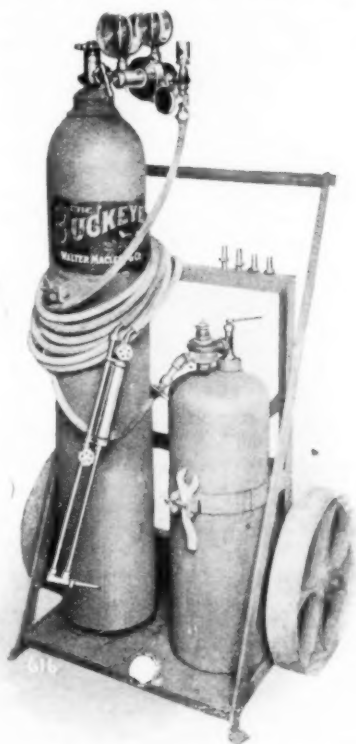


FIG. 3.—BUCKEYE OXY-ACETYLENE WELDING MACHINE.

shows a portable plant mounted on two wheels which can be easily moved from place to place. A plant of this kind could be used with much success for filling in blowholes, repairing bad castings and many other operations and would soon pay for itself.

The cuts, Figs. 2 and 4, show the Buckeye sand blast apparatus. The larger illustration shows the sand blast tumbling barrel, encased so as to practically eliminate the floating dust. The arrangement of this barrel is automatic and the sand can be used over and over again. The barrel is perforated and allows the

air and sand to drop through a revolving screen, which is fitted part way around the barrel, and insures clean sand for the nozzles, then it falls to the screen and hopper below, where it is used over and over again. The small illustration shows the sand blast hose machine. This sand blast has no sand valve to

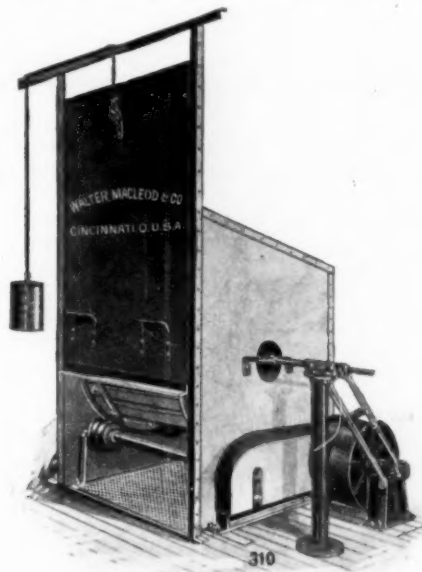


FIG. 4.—BUCKEYE SAND BLAST TUMBLING BARREL.

get choked and clogged, and for this reason has a big advantage over many others.

To those of our readers who are interested in the above outfits we would suggest that they write to The MacLeod Company, Cincinnati, Ohio, who will be glad to furnish all the information desired.

GALVANIZING ALUMINUM

BY ALEXANDER DENES.

That all experiments for brass, nickel, silver and gold plating of aluminum have so far resulted in dismal failure is a well-known fact, and just this constitutes the value of this process which has proved a success, as the plating does not peel off, even after years.

This process is in the hands of one concern in Germany for the whole of Europe, and in my hands exclusively for United States and Canada.

Fifteen hundred dollars are required for installing one galvanic bath of about 50 gallons, at the approximate cost of \$500 for sending out circulars to the metal article manufacturers of the United States, acquainting them with the fact that aluminum articles can now be reliably plated and inviting their orders, which would be sure to come in great numbers, and to start the business generally.

To illustrate what profits can be expected from this business, I beg to mention one order which the German concern received from a manufacturer of tubes for telescoping camera tripods, to nickel plate 500,000 such tubes yearly, at the price of 10 Pfennig (two and a half cents each), the cost of which to the galvanizer is 10 Pfennig a hundred, and one bath of 50 gallons can turn out twenty times two hundred a day, i. e., 4,000, the net profit on these 4,000 being as follows:

Cost of one galvanizer and one helper.....	\$ 8
General expenses	6
Material used almost nothing, but we will say..	1

Total cost, we will say..... \$15

The price charged to customer: 4,000 at \$0.25 each is \$100, and the profit is therefore \$85. Of course, not all work is as lucrative as this kind, but, anyhow, the profits for one bath are conservatively estimated at from \$30 to \$70 a day, and with more baths the net profits will increase more than proportion-

ately, because the general expenses and labor would be less in proportion.

Our prospective intention is either to sell licenses to the different manufacturers and platers which can bring us immense profits, or to enlarge our own plant and to galvanize for manufacturers on orders.

SPOTLIGHT FACTORY PRACTICE

The Newman Manufacturing Company, Cincinnati, Ohio, who manufacture the spotlight brackets shown in the cuts, have a number of reasons why these brackets are of great benefit both to plant owners and workmen. They claim that they will not only reduce the cost of light to one-half because of the great

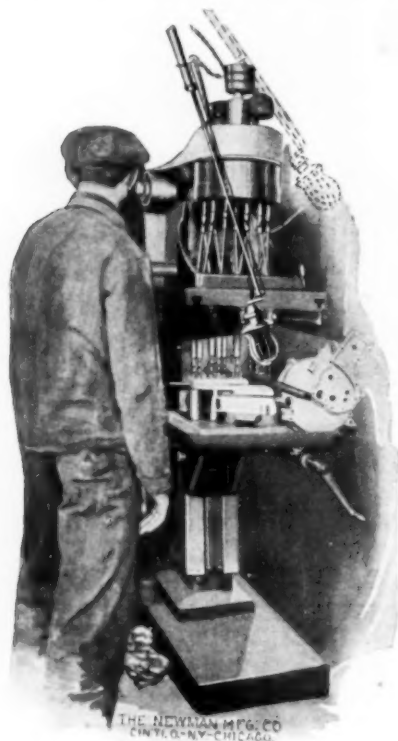


FIG. 1.—TYPE A SPOTLIGHT BRACKET.

efficiency, but at the same time the brackets are great conveniences for saving the eyesight of the employees.

As shown in the cut, Fig. 1, the light is thrown to the very spot required and the glare of the light does not come in con-

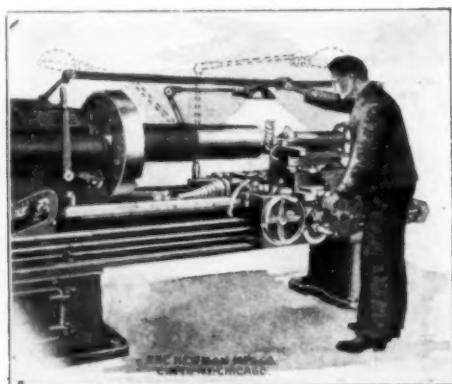


FIG. 2.—TYPE B SPOTLIGHT BRACKET.

tact with the eyes, therefore it means that more work and more accuracy is derived. With a spotlight bracket at the command of the operator the light is moved in a moment to the desired spot and will stay there until it is necessary to move it in an-

other direction. The slightest push or pull on either of the brackets is sufficient to change the direction of the light.

The brackets are made in two styles, called A and B, and bracket B, besides being adjustable to any spot within the three foot radius, also telescopes three feet up or down, thus making this universal knuckle ball joint the highest improved type. The cut, Fig. 1, shows bracket A being used on a multiple drill, and the company states that a man at this machine can turn out more work in less time than by using any other light. Fig. 2 shows the B style of bracket used on a lathe attached to the tee slot of the carriage wing. The machinist on the lathe can do the work faster and with the security of much more accurate work. A catalog fully describing these brackets with their wide application is issued by the Newman company and is entitled "Light." Copies may be had upon request.

AERON SYSTEM OF FINISHING METALS

Complete equipment of the Aeron system of varnishing or finishing with air under pressure, featuring particularly the Aeron exhausting system, was, on invitation, exhibited by the DeVilbiss Manufacturing Company, of Toledo, Ohio, at the Third Annual Industrial Safety Exposition of Ohio, held by the State Industrial Commission at Columbus, the 6th to 10th of March, 1917.

Knowing from its own manufacturing experience that without workmen who are healthy, satisfied and happy—regardless of any other essential qualifications they possess—good and profitable work is almost a unproducible quantity in the best of well equipped plants, the DeVilbiss company has, in addition to perfecting a time and labor-saving, cost-reducing painting system, devoted considerable thought and attention to the development of practical safety and health first equipment and methods in connection with the Aeron system. Moreover, it is constantly endeavoring to devise and work out new ideas and improvements along these lines, with the single view of enlarging to still larger and more effective proportions the scope of this important part of Aeron system service.

As a result of this, the Aeron system of today makes ample provision for the complete removal of all fumes from the finishing room, thereby eliminating the possibility of finishing room sickness and minimizing the danger of fire. Thus it is that clean, pleasant, healthful and safe working conditions are insured in the paint room; that finishers become a happy, efficient and willing lot of men; that manufacturers get desired production and a better quality of work.

ACIERAL, AN ALUMINUM ALLOY

An alloy containing 92 to 97 per cent. aluminum and offered as a metal of strength and lightness and non-corrosive, suitable for use in the construction of automobiles, aircraft, military equipment, railroad cars, valves, hardware, etc., has been put on the market by the Acieral Company of America, 26 Cortlandt street, New York. It is given the name Acieral and is the discovery of M. de Montby, a Frenchman. It is being supplied, it is said, to the French Government for the manufacture of helmets. It is silver white, has a specific gravity of 2.82 and a melting point of 1,382 degrees Fahr. Its tensile strength in castings is given as 30,000 pounds per square inch, and in rods and sheets as 28,000 to 64,000 pounds, and heat treated as upward of 70,000 pounds per square inch. It is claimed that it may be sand cast, die cast with or without pressure, hot and cold forged, annealed, drawn, rolled, stamped, hardened by temper, polished, electroplated and soldered. It withstands the action of all acids except hydrochloric.

With aluminum at 60 cents per pound, Acieral in ingot form will sell, it is stated, at \$1 per pound; for marketing it is furnished in the form of ingots, castings, plates, rods, wires and tubes. It is manufactured in electric furnaces and the plant, located at 20 Orange street, Newark, N. J., has a daily capacity of 10 tons and has been in operation for about a month and a half.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY

The committees of the St. Louis branch have made such progress in their plans for the annual convention, which is to be held at St. Louis, Mo., July 5, 6 and 7, that they are able to make known the following facts. The Planters' Hotel has been selected as headquarters, and with its magnificent lobbies and reception rooms makes an ideal place for a convention. By mentioning the American Electro-Platers' Society Convention, rooms can be reserved at the following special rates by applying direct to the hotel: single room with bath, \$2 and \$2.50 per day; single rooms without bath, \$1.50; double room with bath, \$3.

On Thursday there will be held the regular convention sessions in the morning, afternoon and evening, with the addition of a visit to a factory in the afternoon. On Friday, the morning and afternoon sessions will be held in the parlors of a river steamer while on a trip up the Mississippi, returning to the hotel for the evening session. The final business session of the convention will be held on Saturday morning, in the afternoon a sight-seeing trip and the convention will close with a banquet in the evening.

Special entertainment has been arranged for ladies who expect to attend the convention while the men are at the business sessions. The registration fee of \$3 for delegates and visitors includes convention expenses and banquet, but the ladies will be charged only for the banquet. The committee on exhibits is anxious to interest members of the society to send samples of finishes or work, together with information, and suggest that they write to F. C. Rushton, 4405 Blair avenue, St. Louis, Mo., for particulars.

H. J. Richards, chairman of the committee on papers and discussions, would like to hear from members as soon as possible who propose to read papers at the business sessions so the list can be published in the June issue of THE METAL INDUSTRY.

St. Louis Branch—F. C. Rushton, 4405 Blair avenue, St. Louis, Mo., secretary and treasurer.

The regular monthly meeting was held Saturday, April 21, at which time the committees for the 1917 convention made their reports. The different branches have been requested to send branch and individual exhibits of finished work, and the manufacturers of electro-plating equipment have also been invited to exhibit.

An interesting letter from E. W. Heil, of Wichita, Kan., on single salt solutions was read and samples of work shown, and the following questions received from Mr. Heil were discussed: (1) Why does a muriatic acid dip become greasy when used between the cleaner and plating tank, when work has been properly cleaned and rinsed before entering the dip? (2) Would the plating of tern metal in a hot copper solution tend to contaminate the solution, and would it cause bad work when plating stove castings, britannia metal, etc., in the copper solution?

New York Branch—H. H. Reama, president, and Wm. Fischer, 300 St. Anns avenue, New York, secretary.

This branch held its regular monthly meeting on April 27, when an interesting discussion was had on brighteners for solutions and how to get the best results from their use. Mr. Voss also inquired of the members what would be the most interesting subjects for the Bureau of Education to take up, and the following were suggested: The fundamental principles of electrolysis, the spotting-out of electroplated work, brighteners for various solutions and pitting on nickel deposits.

Bridgeport Branch—W. G. Stratton, president, and Nelson Barnard, 858 Howard avenue, Bridgeport, secretary.

The Bridgeport Branch will hold its fourth annual banquet

at the Stratfield Hotel, May 12, 1917, at 7 P. M. sharp. A committee will be in the hotel parlors all day on May 12 to take care of members and their friends. Any samples that are to be exhibited should be sent not later than May 8 to the American Electro Platers' Society, 260 John street, and will be taken care of by the management there until such time as the exhibit is to be set up.

Indianapolis Branch—B. D. Aufderheid, president, and Louis Mertz, 1725 Union street, Indianapolis, Ind., secretary.

Mr. Ormsby resigned as librarian of the Indianapolis Branch at its last meeting, which was held on April 14, and Mr. Cromer has been appointed to serve in that office for the remainder of the term. A report of the banquet committee was received and accepted.

Philadelphia Branch—Philip Uhl, 2432 North 29th street, Philadelphia, Pa., secretary.

The April meeting of this branch was held on April 6, with President Bell presiding. Mr. Bell exhibited samples of plated die castings and also gave a short talk about them, after which Dr. Lukens gave an interesting address on "How to Keep Up a Nickel Solution," and explained the action of the different conducting salts.

AMERICAN INSTITUTE OF METALS

The institute, through its president, J. L. Jones, has taken the following action:

HONORABLE WOODROW WILSON,
President of the United States,
Washington, D. C.:

Dear Sir—On behalf of the executive board and members of the American Institute of Metals I wish to herewith pledge through you our loyal support of the United States Government in view of the present great emergency.

Our organization consists largely of corporations, managers, superintendents, foremen and skilled employees who are engaged in the producing, founding, working and finishing of copper, brass, aluminum, zinc, etc.

We are already acting in an advisory capacity on non-ferrous matters with your Bureau of Standards, and it is suggested that our society might afford valuable aid in the inspection of manufacturing processes, devising substitutes for material no longer available, and in speeding up production.

I have asked our secretary, W. M. Corse, of Buffalo, N. Y., to send you the present membership list of the society and detailed information in regard to its organization.

Awaiting your further distinguished commands, I am,

Very respectfully, **JESSE L. JONES,**
President, American Institute of Metals.

Pittsburgh, Pa., April 30, 1917.

Secretary Corse reports that:

A meeting of the executive committee was held at Hotel Raleigh, Washington, D. C., Friday, April 27, 5 p. m., at which were present: President Jones, G. H. Clamer, DeCourcy Browne, W. R. Webster, W. A. Cowan, Dr. Merica, G. C. Stone, F. L. Antisell and P. E. McKinney, of the Washington Navy Yard.

It was moved and seconded after discussion that Dr. Paul D. Merica be made editor of the new journal.

It was moved and seconded that the name of the new publication of the institute be called THE JOURNAL OF THE AMERICAN INSTITUTE OF METALS.

It was moved and seconded that the publication of the quarterly occur on September 1 and every quarter thereafter. It may be possible to get out an issue in June or July, and if so this will be done.

Mr. W. A. Cowan, chairman of the papers' committee, then

presented a report of the papers for the next meeting, and showed a list of 35 which were available. This committee gave a vote of thanks to Mr. Cowan and his committee for the splendid work as shown by the report. The details of editing the journal in reference to printing, cover plates, etc., were left to the discretion of the secretary and Dr. Merica, who were appointed a committee of two to handle this matter.

AMERICAN FOUNDRYMEN'S ASSOCIATION

To promote the adoption of a uniform system of foundry cost accounting among its members, the American Foundrymen's Association has outlined a plan of procedure and has engaged the services of the C. E. Knoepfel & Company, of New York, to carry on the work. Subscribers to the fund which will be raised for prosecuting this work, are limited to members of the Association, but foundries not so enrolled can derive the benefit of this great work by becoming members of the association.

Information may be had by corresponding with Secretary A. O. Backert, Twelfth and Chestnut streets, Cleveland, Ohio.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

Commissioner W. M. Webster, under date of April 23, has sent out the following letter:

"At a recent meeting of the National Association of Brass Manufacturers held in Chicago, Ill., the feeling seemed to prevail that there were no present indications of prices in raw materials

reaching a lower level and with the attitude of labor either seeking shorter hours or advances in wages which in many cases was not only just, but necessary in order to meet the constant increase in costs of living, these facts together with a likelihood of an advance in freight rates, in view of the recent decision handed down by the United States Supreme Court on the Adamson Law—some lines having already prayed for relief and higher rates—all of which would tend to keep prices at their present level if indeed it does not carry them to even a higher standard of values.

"Reports from all sections indicate that a good trade would be had during the coming season, and in many cases it was reported that the manufacturers were operating their plants to full capacity and in some instances overtime to fill orders on hand, all of which should stimulate confidence generally.

"Since the meeting in question, Congress has declared that a state of war exists, and as a result it is not unlikely that a number of our larger plants in the brass line may be commandeered for the manufacture of munition and other purposes, which if it does, will materially lessen our points of production and output.

"A jobber who may have been fortunate enough to place contracts at lower than the present standard of values, the meeting felt should not exhibit any anxiety, sacrifice his profits or offer his goods so purchased at reduced prices, but rather to avail himself of his good fortune to offset disadvantages and loss that must necessarily follow on the day of readjustment and lower values, which will surely come to us all.

"It was thought well if the manufacturers and jobbers would impart this information to their sales forces so that they in turn may convey it to their customers, believing that it would not only tend to stabilize matters and generally speaking better conditions, but operate to the general advantage and profit of all."

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

John R. Baynes, formerly with American Thermos Bottle Company, Norwich, Conn., is now connected with the Colonial Brass Works, Middleboro, Mass.

G. H. Niemeyer has been elected to the position of sales manager of Handy & Harman, manufacturers of sheet silver and silver anodes, with headquarters at 59 Cedar street, New York. Mr. Niemeyer will also continue as manager of the New York plant, which is located at 31 Gold street. Ralph Blackburn will represent Handy & Harman in the New England territory.

Dr. George K. Burgess, of the Bureau of Standards, Washington, D. C., is a member of a party of six American scientists who are on their way to England and France to co-operate with scientists in those countries in studying problems arising out of the war. He will make a study of metals suitable for guns and rigid dirigibles. The party was sent jointly by the Advisory Commission of the Council of National Defense and the National Research Council.

DEATHS

Ralph Turner, retired general manager of the Manhattan Brass Works, of New York, and for fifty-five years a resident of Paterson, N. J., died of heart disease April 13, at his home in that city. He leaves one daughter.

Charles A. Gregory, president J. H. Gautier Company, manufacturer of crucibles, Jersey City, N. J., died April 1 at his home in New York City, aged 79 years. He was born in Jersey City and founded the company of which he was president more than 50 years ago. His father was Jersey City's first mayor. He had a physical breakdown three months ago and had to give up active business. He leaves three daughters.

George H. Sargent, president of Sargent & Company, New Haven, Conn., ranking among the largest manufacturers of general hardware in the world, died April 14 at his home in

New York City, aged 89 years. He was born in Leicester, Mass., in 1828, and was graduated from Harvard in 1853, in the class with Charles W. Eliot, ex-president of the university. He removed to New York about 60 years ago and went into the hardware business with an older brother. He participated actively in the conduct of the business until a short time before his death. He was a member of the Union League and Hardware clubs, and leaves a married daughter.

DAVID H. BROWNE

David H. Browne, chief metallurgist of the International Nickel Company, died on March 30, 1917, at his home in Montclair, N. J., after a short illness at the age of fifty-two.



DAVID H. BROWNE.

He was born in 1864 at Hollymount, County Mayo, Ireland, and received his early education at the Londonderry Academy. At the age of sixteen he came to the United States and entered the University of Michigan, graduating in 1885. Following employment as a chemist at various metallurgical plants, Mr. Browne returned to the University of Michigan and served as instructor in inorganic analytical chemistry in 1888 and 1889. When the Canadian Copper Company was organized he entered its service and was connected with it

as chief metallurgist until it was absorbed by the International Nickel Company, the staff of which Mr. Browne joined. Most of his professional life he spent at Sudbury, Ont., but in 1914 he was transferred to the head office of the International Nickel Company in New York.

Mr. Browne's first big achievement was the development of his electrolytic process for the separation of nickel and copper in Sudbury ore. This process was in successful commercial operation for several years, but when the Canadian Copper Company was absorbed by the International Nickel Company the process was abandoned in favor of the cheaper Oxford process owned

by the latter company, and which is the process now in use.

The second big achievement of Mr. Browne was the successful reduction to practice of powdered-coal firing of reverberatory smelting furnaces. This he was the first to do successfully on a large scale at Sudbury, and he freely gave full information of the success obtained and the means employed to others to follow suit. This has now become the practice in a large number of smelting and refining plants.

In 1916 the honorary degree of Doctor of Laws was conferred on him by Queens University.

Mr. Browne is survived by his widow and three sons.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

MAY 7, 1917.

Preparedness is getting every attention in these days of war throughout the length and breadth of the Naugatuck Valley, and the captains of industry are taking their places as the captains of various movements originating at the seat of the National, State, or City Governments, looking towards putting the forces of the Republic in the best possible order. So it is that between he busy and rather absorbing duties of their ordinary occupations the brass, silver and copper makers of this part of the country, with their factories running full blast, in many instances twenty-four hours every day of every week, one may find heads of big corporations issuing orders or taking orders in his other capacity as orderly at the headquarters of the Connecticut Home Guard, or the Waterbury City Guard, or adjutant, or captain, or lieutenant. Or he may be discovered at a serious session with other manufacturers of the State, and business men, considering how to get larger crops out of the land, cultivated and uncultivated, within the State, that starvation may not follow, even if communication with the South and West be cut off by the enemy. Or he may be found planning for the enlargement of facilities of one kind or another to improve the product of his own or other plants that may be of first importance in providing for a proper supply of the munitions or equipment of the army or navy, or to adjust matters so that, if conscription comes, he will be prepared to replace those who must go with hands whose skill will not be wholly uncertain.

In a word, the industrial chieftains hereabouts are all keenly alive to the fact that war has been declared and that it is a good policy to have done with it as soon as possible. All that they can do is being done as efficiently and as willingly as possible, and there are no grumblers. Reserve organizations are being strengthened rapidly with recruits from the best forces of the State, and the Naugatuck Valley industries are represented in the higher councils by some of their brainiest and busiest leaders.

Business is not being neglected. The rush has been on so long that all are accustomed to it now, and efficiency probably never was at a higher point than it is today. Possible emergencies are being considered and discounted as far as possible and a most commendable spirit of co-operation with the Government along the lines it suggests or lays down is obvious.

Labor is still enjoying special privileges, but is most efficiently organized, and even the somewhat annoying placing and displacing of freight embargoes and occasional shutting off of raw materials fail to make any serious impression on the prosperity of the industries.

Great attention is being given just now to the campaign for home gardening, and the factories of Waterbury are co-operating with the Chamber of Commerce in encouraging the planting of gardens by the workers. Employes are being allotted parcels of land which has been plowed and in some cases fertilized for them by their employers, and supervisors are being provided to encourage them and instruct them so that they may get the best possible results. Throughout the State this movement is spreading. The Chase Company has opened up several acres to their employes and several others are about to do the same. The

Blake & Johnson Manufacturing Company took an offer of a large tract of land for the use of their help. The Bristol Brass Company also has prepared a large tract in Bristol.

Just at present, outside of the war question, domestic business is remarkably fine. Every industry in the brass and copper producing branches is enjoying unprecedented prosperity hereabouts today. Materials and labor come high, but there is a great volume of profitable business, although it would not be so if the manufacturing companies had not long ago mastered the question of efficiency and the problem of economizing in labor and materials without risking unnecessary delays in production. There is hardly a brass or copper factory that is not supplied with orders far ahead of the present season and at first class prices. Clock, watch, wire, pin, machinery, brass novelties, automobile supplies, engine parts, motors, and the odds and ends of brass in sheets and tubing, all are being produced in the greatest possible quantities and for domestic orders. So busy are all concerns with these lines that there is scant attention paid to inquiries as to expansion of foreign trade fields. There is no time just now for the consideration of these matters owing to the pressure of problems affecting production for the markets at home.

Meanwhile the larger manufacturing corporations find themselves compelled to give more attention than ever before to social problems arising out of conditions born of this prosperity. The work of finding homes for the new workmen who are within the city now and who are eager to bring their families here, is still difficult, although within the past 150 days just 150 homes for workingmen have been completed in the extensive house building campaign of the Scovill Manufacturing Company and the American Brass Company. Within a few days two more large corporations will probably begin similar operations, and throughout all the coming summer and fall there will be good-sized armies of building forces at work erecting houses for these corporations on the great tracts laid out by them for housing purposes. In all these operations, the most modern principles and the most approved social conditions are observed and applied. Workmen are thus enabled to purchase their own homes with small payments down and the rest in monthly instalments practically the same as rent bills. Within seven years the men who buy will have become owners of their own homes and the lots they occupy free of all but a first mortgage, if they do no more than follow the schedule of payments laid down by the corporations employing them.

Waterbury is the first city in the country to adopt this single housing plan for workingmen's families, and throughout the country its operations in this direction are to be revealed in motion pictures which will soon be released for public display.

The Chase Metal Works is still extending its large new tube mills in Waterville, and the office building of the Chase Corporation, which will be erected in Grand street, will be under construction in a few days. Extension of plants of the American Brass Company is still in progress and this corporation's operations continue on a most extensive scale wherever it has factories.

The Waterbury Farrel Foundry & Machine Company and the machinery makers throughout this section report continued busi-

ness at capacity. War will only serve to add to the volume of this business.

In Thomaston there are signs of a revival of activity in all departments of the Seth Thomas Clock Company and the Plume & Atwood Manufacturing Company's mills, there and in Waterbury, continue to be extremely busy.

In addition to its new models of watches, the New England factory of R. H. and C. H. Ingersoll is turning out check-writing machines in growing volume. Bristol reports all its thriving young brass and copper industries running at capacity and very prosperous.

Warlike conditions have served to bring about the raising of local police forces to five times their normal size, and every large plant is constantly under special guards in uniform, as well as in plain clothes.

Stocks of local corporations are enjoying high quotations and steady patronage among investors these days, and the prospects are favorable to an advancing market, indefinitely, if the trouble with Germany should assume extensive proportions.

Owing to the great importance of a supply of skilled labor in these industries there is marked interest among the manufacturers of the State in the recommendation of State authorities, approved by the State Chamber of Commerce, that an industrial army be created so that all industries important to the equipment of fighting forces may be preserved intact, if possible, until such time as competent substitutes, either of men physically incapacitated for military or naval service, or of women, shall have been found to fill their places when they go into military service. It is expected that if this step be taken a number of other States will fall in line and seek to preserve the strength of their industrial resources in the same manner.—F. B. F.

BRIDGEPORT, CONN.

MAY 7, 1917.

In spite of, or perhaps because of, the entrance of the United States into the European war, the metal business in Bridgeport seems to have taken a slightly upward rise in the last month. Many of the prominent manufacturers when asked how the business being done at the present time compared with that done a month or two ago, stated that it was showing a good increase, and that, furthermore, the indications were that it would still continue to increase for some time to come.

Bridgeport, or parts of it, are just at the present time under martial law, it being a common sight to see armed soldiers patrolling the limits of various factories about the city. The Remington Arms Co., the U. M. C. Company, the Bridgeport Brass Company, the Lake Torpedo Company, the American and British Company, and the American Tube and Stamping Company are all being guarded by regulars and militia.

An incendiary fire at the plant of the American Tube and Stamping Company some time ago resulted in the doubling of the guards set around the shops of the city, and in many places it is now necessary to hold a special pass to enter the barred zones. Trolley cars going through the restricted areas are boarded at the first line by armed soldiers who close the front and rear doors and station themselves there. When the trolley arrives at the end of the area, the doors are opened and the soldiers alight to board the next car going in the opposite direction.

The Artistic Bronze Company, which does a large business in castings and hardware, reports that its business is better now than it has been for some time. They manufacture both builders' hardware and cabinet hardware, and they state that the demand for each is on the wing all the time. While not seeking Government orders they have fallen heir to their share of them and are at the present time engaged in filling a rather large order in the casting department. Labor conditions have also changed quite a bit from what they were last winter, and they and the other manufacturers have no trouble in securing all the help they need.

The Bridgeport Deoxidized Bronze and Metal Company, dealing for the most part in castings of various sorts, have also noted an improvement in their business the last month or two. They have done some Government work already and have in view several contracts of a slightly larger aspect which, if allotted to them, will carry them through a period of not less than a year and a half. Labor conditions at the shop are a great

deal better than last winter, although the Deoxidized company has the same trouble as the rest of the shops in the shifting of the workmen. In a city in which as many factories are located as in Bridgeport there is usually to be found this constant shifting of workmen from one factory to another and sometimes back again. This company also states, however, that they have no trouble in securing all the first-class help that they need.

The Bridgeport Metal Goods Company is of the opinion that business in the metal line will continue to climb as it has done in the past year. In their case they state that the improvement since this time last year is indeed remarkable and the improvement in the last month or two has also been quite marked.

The Cave Welding Company, the Monumental Bronze Company, the Bridgeport Brass Company, the Newfield Silver Company, and most of the other metal manufacturers in the city agree with the foregoing companies in stating that from present indications the metal trade as it concerns Bridgeport is going to be on the increase rather than a decrease during the coming months. While the number of Government orders which are placed in this city are not great, still they add to the regular business and are appreciated wherever they are given out. There has been a noticeable falling off in the foreign orders in the last few months, but this loss has been more than made up by the increase in domestic work.—L. M. P.

NEW BRITAIN, CONN.

MAY 7, 1917.

April wanes and May dawns with business conditions among the metal manufacturing concerns in this city practically unchanged from past months, and as yet the local industries have not even begun to feel the stress of war, either in war orders, war taxes or dearth of men to work. Business in all of the shops remains very good, with absolutely no hint of any labor trouble fomenting. Unless unforeseen events follow, the factories here can reasonably look forward to a successful spring and summer. Unlike some other cities, with concerns making munitions entirely, the approach of peace would stimulate business here. While many of the concerns have profited indirectly by the war, by taking sub-contracts for machinery, tools, etc., and occasionally a minor direct order, the advent of peace would set the wheels of industry humming as they have never done before, factory officials state. Exactly opposite from some cities, New Britain is a peace products manufacturing place. Its mammoth output is almost entirely of builders' hardware, cutlery of all sorts, domestic hardware, and machinery. Many feel that peace will particularly boom the Landers, Frary & Clark Company, now the largest cutlery manufacturing concern in the world, for not only is pocket cutlery made here, but so, also, is table cutlery and every conceivable thing for use in the domestic home. Thus, New Britain is not one of those so-called "mushroom towns" where peace is to be feared as bringing about an end of the "business Utopia" enjoyed during the past two years. Something of an idea of the growth of New Britain's factories, reflecting the volume of business done, may be gained from the following account of the building additions for the two years ending November 30, last: Stanley Works, fourteen wooden buildings; Landers, Frary & Clark, five brick additions; Hart & Cooley, three brick additions; North & Judd, four brick additions; P. & F. Corbin, one concrete addition; Hart & Hutchinson, one wooden addition; Humason & Beckley, one brick addition; Beaton & Cadwell, two brick additions; Fafnir Bearing Company, one brick addition; American Hardware Corporation, one brick addition.

Business at the New Britain Machine Company is brisk, and in order to cope with the heavy orders it has been found necessary to operate a number of the departments overtime at intervals. The Union Manufacturing Company continues to receive substantial orders and is now building another addition to its plant on Church street. The addition is to be of brick and two stories high. The largest latest addition, however, is the one planned by the previously mentioned concern, the New Britain Machine Company having decided to make several changes which will include the construction of a two-story brick factory addition, 300 x 57 feet and costing \$40,000. The concerns are also taking an active interest in the food supply question, and already the Landers, Frary & Clark Company and the Stanley Rule & Level Company have offered their employees the use of large

tracts of land for garden purposes. President Alex Stanley, of the last-named concern, has turned over a portion of his private estate for the use of his employees.—H. R. J.

TORRINGTON, CONN.

Dangers of Conscription to Connecticut Industries

MAY 7, 1917.

In returning the military caucus blank to the Bureau of Military Census at Hartford, Conn., on March 19, 1917, L. G. Kibbe, president of the Turner & Seymour Company at Torrington, Conn., said:

"In addition to commending you for the excellent work you are doing in compiling statistics as to the availability of Connecticut factories for use in case of need, I respectfully submit for your earnest consideration the suggestion that an industrial reserve be immediately established in this State. In the event of war New England would be called upon to supply a large part of the equipment, munition, etc., required by the government. Connecticut contains a large number of highly skilled workmen who are particularly qualified by training for making tools, gun parts and other munitions. In the recent mobilization of the National Guard it was demonstrated that these highly skilled artisans and mechanics responded freely to the call for volunteers, and it is my belief that a declaration of war with a foreign government of the first magnitude would see our factory organizations depleted through the hasty action of the workmen in responding to a call for volunteers. This is the experience that France and England went through in a most costly manner, and it seems to me that the most patriotic thing Connecticut could do at this time would be to conserve for government use our skilled mechanics and trained organizations.

"By permitting the skilled workers to volunteer as soldiers in the army of England that nation not only suffered tremendous losses through inability to supply necessary equipment, but incurred great expense in first training these artisan soldiers, and after same had been recalled to the factories there was incurred the additional expense of training substitutes to take their places in the ranks. Unless immediate action is taken to form an industrial reserve, or otherwise conserve our skilled men and organizations, there is no reason to believe that we would not suffer, in the event of war, the same experience as England. More than that, it is my opinion that should we face a serious war the non-manufacturing States would supply more soldiers in one month than this country could equip in a year. It may not be as glorious or it may not advertise our patriotism so much to retain our men in factories as to send them to the front, but it should be the duty of everyone interested to do that for the government which will be of the most service, even though we sacrifice an opportunity to accentuate our sentimental patriotism.

"The psychology of war calls for some tangible recognition of the patriotism of individuals. That is why men leave their jobs and don uniforms at a time when the greatest service might be rendered by remaining at machines. Therefore, in order to dignify the members of the industrial reserve, and to give visible recognition of their patriotism, I would suggest that volunteers sign a regular enlistment form pledging their services to the government in any capacity which the proper officials may designate, and that badges or other insignia be provided for identifying members of the industrial reserve. Under such enlistment it does not at all mean that members are absolved from military duty, but it does mean that they will remain at work until called upon to serve in a different capacity. Such a reserve would give the government, through its proper departments, an opportunity to select skilled workmen from plants not fitted to manufacture munitions, and to mobilize such mechanics in other plants better equipped for such manufacture. After the munitions and equipment factories had been completely organized from members of the industrial reserve, any surplus from members could be utilized as soldiers if needed.

"It is conceivable that an entire organization consisting of superintendent, foremen and skilled workers could be moved to advantage from a poorly equipped factory to one properly equipped, and thereby substantially increase the efficiency of the latter. The experience of the munitions factories in executing orders for foreign governments during the last two and

one-half years has shown conclusively that the one essential to success is organization. This very experience through which we have passed has served to train thousands of skilled workmen in the State of Connecticut, and has developed some splendid organizations, which with but little if any loss of time could be utilized in any factory in the manufacture of parts for the government. To my mind it would be a calamity for the State of Connecticut to lose the potential value of these men and organizations, and I can think of no more patriotic or useful service that Connecticut could render than to hold intact these trained organizations.

"In order to prevent the abuse that might arise through the enlistment as mechanics of men not qualified as such, the officers of each factory could be held responsible for the character and qualifications of the men enlisting from their plants; and to hold the units of organization intact the managers, superintendents and foremen might be made officers of the industrial reserve, and have direct supervision over their own men. There is in each county of Connecticut but one, an employers' association, and almost every manufacturing center has some form of manufacturers' association or chamber of commerce. It is my belief that these associations would gladly volunteer their services in assisting in the enrolment of qualified workmen.

"Unless something is done along the lines suggested it is a safe assumption that a call for volunteers will disrupt every organization in the State of Connecticut, and when the factories are called upon to do their part in supplying equipment and munitions chaotic inefficiency will be the result.

"I have talked with the heads of several manufacturing concerns familiar with the making of munitions and parts, and the proposed organization of an industrial reserve has met with approval from all. I therefore respectfully urge that the subject outlined herein be given your careful consideration, and that if expressions are desired from other manufacturers an early hearing be arranged, to which should be invited the prominent manufacturers of the State."

PROVIDENCE, R. I.

MAY 7, 1917.

The April issue of THE METAL INDUSTRY contained the statement that the Eastern Foundry Supply Company of 75 Westminster street, had discontinued business. This we find is not so as we are informed very emphatically by Manager Nicholson that the Eastern Foundry Supply Company, Inc., is in business, and is very busy supplying the trade with all kinds of foundry supplies.

A notable casting was made recently at the foundry of the Gorham Manufacturing Company. A statue of Phillip Brooks, a prominent Episcopal bishop of New England, was cast in bronze in seven and one-half minutes from the time of starting to pour until the metal was in the mold. The metal was melted in two No. 94 Monarch Simplex metal melting furnaces without crucibles installed by the Monarch Engineering & Manufacturing Company, Baltimore, Md. The operation of melting and pouring this metal, which consisted of 4,850 pounds, was carried out under the direction of M. W. Woodburn, the expert of the Monarch company. The metal was charged in the furnaces at 12:10 p. m., and was ready for pouring at 3:45, a period of 3 hours and 35 minutes, which constitutes a record for the rapid melting of art bronze. A number of church dignitaries, including the Bishop of Rhode Island, were present at the pouring of the casting, and it is said that the handling and pouring of such a large body of molten metal in such a rapid and efficient manner was in the nature of a revelation.

BOSTON, MASS.

MAY 7, 1917.

Officials of the National Associations are scheduled to come to Boston within the next fortnight to discuss plans with the officers of the New England Foundrymen's Association relative to the annual convention to be held at Mechanics building, this city. It is expected that exhaustive details will be considered and that the program will be greatly advanced at this meeting.

The platinum industry in this section has received a setback by the appeal of the Government that an effort be made to conserve platinum by substituting gold or other metals for parts not

appearing on the surface. Resolutions adopted at a recent meeting in New York of manufacturers have been circulated among the trade and have been signed by the local houses. The resolutions read:

Whereas, the Secretary of Commerce has requested the Platinum Committee of the Jewelers' Vigilance Committee to bring to the attention of the jewelry trade of the United States the advisability of conserving platinum in order that our Government may have larger supplies to draw upon for war purposes, and

Whereas, the jewelry trade has already expressed its desire and determination to assist our Government to the extent of its ability to bring the war to a successful termination,

Be It Resolved, that we pledge ourselves to discontinue and strongly recommend to all manufacturing and retail jewelers of the United States that they in truly patriotic spirit discourage the manufacture, sale and use of platinum in all bulky and heavy pieces of jewelry.

Be It Further Resolved, that during the period of the war or until the present supplies of platinum shall be materially augmented, we pledge ourselves to discontinue and recommend that the jewelry trade discourage the use of all non-essential platinum findings or parts of jewelry, such as scarfpin stems, pin tongues, joints, catches, swivels, spring rings, ear backs, etc., where gold would satisfactorily serve.

Be It Further Resolved, that the jewelry trade encourage, by all means in their power, the use of gold in combination with platinum, wherever proper artistic results may be obtained.

Be It Further Resolved, that copies of these resolutions be handed to the Secretary of Commerce, to the trade press, and be sent to all our trade organizations, and to the daily press, in order that they may have the widest possible dissemination.

The following named local houses have attested their approval by signature: A. S. Kelley, Henry G. Morris, president Boston Manufacturing Jewelers' Association; M. W. Levy, J. M. Glaser, H. V. Burnham (Ripley Howland Manufacturing Company), D. Goldwasser, John Cahill, Harry Smith, C. A. Bugel, W. J. Orkin, Peter Ratzkoff, Harry Heller, J. Rockman, E. W. Kirby, C. H. Singleton, Henry E. Alsterlund, Herbert Grutchfield, C. W. Somers, Angelo Cavallo, William Falk, Bigelow, Kennard & Co., Smith, Patterson & Co., J. Luis, H. Lurie, H. Jukes, Abrams & Green, Charles M. Ward, A. Stowell & Co., R. T. Hewitson & Co., and Frederick Hight.

The B. T. Sturtevant Company still is overloaded with orders, and the big plant at Hyde Park is running overtime to keep up with the demand for its various metal products. The employees now number almost 2,000, the largest number in the history of the company. This month the semi-annual bonus to office employees was distributed.

The Naugatuck Valley Crucible Company began operations this month manufacturing crucibles in the plant of the Derby Paper Company at Shelton, which has been remodeled to suit the needs of the new concern.

Local manufacturers await war developments with the utmost confidence. There are but few signs that business will be immediately perturbed on account of the international situation. In fact the hastened preparations for defense seem more stimulating than otherwise. Many of the concerns have voluntarily placed their plants at the disposal of the Government. Practically every metal industry is represented in the lists of the concerns which are now being prepared by the war and navy departments.—R. T. E.

ROCHESTER, N. Y.

MAY 7, 1917.

There has been somewhat of a lull in the metal business in this city during the past month, but in general lines conditions are unchanged so far as the real output of manufactured materials is concerned. The situation has come about in Rochester owing to a degree of uncertainty that prevails in all circles. This feeling is holding up things in general. Just what effect the enormous loans to the Allies will have on the business prosperity of the country local manufacturers admit they are unable to figure out. If the loans will mean new contracts for munitions the resumption of high-tide conditions is assured. At the present time the general outlook is promising. All local

concerns having munition contracts have completed them, and not a shell is being turned out in this city today.

Car shortage continues to interfere with a number of the larger plants about the city. Manufacturers are not inclined to blame the railroads either for the unpleasant situation. Cars are being loaded in factory sidings in this city that should have left Rochester on April 1. In a number of instances cancellations of contracts have been received, owing to the fluctuation of metal market conditions and the failure of shipping facilities. Despite these handicaps Rochester manufacturers are cheerful and hope for a clearing of the general car shortage in the near future.

Coates, Bennett & Reidenbach yesterday shipped fifty tons of brass ingots to Canada. The firm has shipped more than a million pounds to Canadian munition makers during the past year.

The market for all grades of copper is easy, with red brass ingots quoted at 21 to 25c. and yellow at 20 to 23c., according to specifications. Copper is firmly held at 27 to 30c. Demand for zinc and spelter is active. Great quantities of spelter have been required here since the first of the year, but users have had no particular difficulty in obtaining supplies. Aluminum is in strong demand at current market prices. Babbitt metal firm. Lead is scarce and higher.

The stockholders of the North-East Electric Company, a large user of metals, have voted to increase the capital stock of the concern from \$600,000 to \$1,000,000. Increased business is given as the direct reason for the added capitalization. William A. Montgomery is president of the company and J. J. Stafford is secretary. The concern manufactures automobile accessories and electrical apparatus.—G. B. E.

CLEVELAND, OHIO

MAY 7, 1917.

To a Cleveland firm has come the appointment of one of the most important positions in connection with supplying the Allies with products of the metal industry. The Gaston, Williams & Wigmore Company have been appointed American representatives of a Russian council of metal industries, for all raw materials, metal working machinery and factory equipment bought in the United States. The council represents a union of all metal consuming interests within the borders of Russia. The Gaston firm is now said to be doing an annual export business of \$5,000,000. The significance of this firm in becoming identified with the Russian government is traced back to 1914, when it closed contracts for ships to carry munitions and other products for export. Then the others had to come to Gaston's company to get the goods to Europe.

Another phase of the crisis between this country and Germany has been most forcibly demonstrated by the officials of the W. S. Tyler Company, who have agreed to pay full wages to all employees who enlist in the governmental service. This is the first Cleveland firm to make this offer. "We believe every man owes a big debt to his country, and should be willing and anxious to serve," said Assistant Secretary E. C. Downer, of the company. "We believe we also owe a debt to the country, and can partially pay this by paying the men while they are away." Many have taken advantage of this offer and have enlisted. The plan embraces all employees who have been with the firm more than six months.

Contracts for copper wire to be used by the city division of light and heat, are being considered by the City Council. The wire will cost more than \$40,000.

The Monarch Brass Company has insured each of its employees for \$500, A. S. Deutsch, president, has announced. For succeeding years of service additional insurance will be taken out until each employee is insured for \$1,500.

A lecture on "Electrical Heat and Treatment of Copper and Brass" was delivered at the Cleveland Engineering Society by T. F. Bailey, president of the Electric Furnace Company, Alliance, Ohio.—C. C. C.

CINCINNATI, OHIO

MAY 7, 1917.

While there have been some factors tending to cut down business of late, it is still true that the various departments of the

metal industries in this section continue to run at full capacity, with every prospect of an indefinite continuance of that situation. Specifically, while the war has tended to cause many business men in general commercial lines to withhold orders, in order to gauge the probable effect of this great factor on business in general, it has, on the other hand, greatly stimulated the lines which for more than two years have been receiving direct benefit from war orders. Since it has become certain that the allied governments will place even larger orders with American factories than ever before, and that the American Government itself will be a large buyer of munitions and materials, it is obvious that the lines referred to will be busier than ever; and consequently not only the makers of munitions and parts, but the machine-tool manufacturers, and the foundries furnishing material for them, have received ample assurance of continued good business. The liquor trade, formerly a large and reliable customer of the coppersmiths, especially in the spring season, remains a "weak sister," as for two or three seasons past, on account of the increasing strength of the prohibition movement, and the discussion of late of the possibility of national prohibition as a war measure. While it is not generally believed that the latter possibility is of immediate importance, it is still sufficient to cause distillers and brewers to withdraw from the market as far as improvements and new construction are concerned. On the other hand, some of the more optimistic among the distillers point out that the heavier buying of munitions which is probable, is a point worth remembering, in view of the essential nature of alcohol as an ingredient in many explosives, and the importance to the government of distillery plants which have been converted into alcohol producers. It is extremely probable that many more distilleries will be converted into alcohol plants if the alcohol market shows signs of further strength, and this means big business for the coppersmiths.

The Metal Stamping & Manufacturing Company, of Cincinnati, has filed a deed of assignment for the benefit of its creditors, giving its assets as \$750 and liabilities as \$2,000. The high prices of metals is said to have been the chief cause of the failure. George F. Dittman is the assignee.

Suit has been filed in Covington, Ky., by the Louis P. Herman Company, of Louisville, Ky., against the Hugo Burgheim Company, of Cincinnati, asking \$6,290 damages, claimed to be due in part for merchandise and in part for alleged breach of contract in the buying and selling of scrap metal. Attachment was filed in connection with the suit against a quantity of metal said to be located in Covington.—K. C. C.

COLUMBUS, OHIO

MAY 7, 1917.

The metal market in Columbus and central Ohio territory is somewhat changeable. Some metals are rather strong, while others have shown a market weakness. This is due to the changed conditions incidental to the entrance of the United States into the war and is expected to be only temporary. On the whole, the tone of the market is not up to that of previous months.

The red metals are rather weak and some declines are noted over previous quotations. Copper is selling at 25 cents for scrap and 26¼ cents for casting. Spelter is also off, selling around 9¼ cents. Zinc is also one of the metals which has developed considerable weakness recently. Tin continues strong and the same is true of babbitt and type metals. The demand for that class of metal is exceedingly strong. Brass is rather unsettled and prices show a rather wide variation.

The Ohio Metal Company, located at Fourth street and Fourth avenue, Columbus, has started a large addition of 4,000 square feet, which will increase its facilities.

The Ohio Brass Company, of Mansfield, Ohio, has increased its capital by \$500,000, the proceeds of which will be used in factory extensions.

The Ryder Brass Foundry Company, of Bucyrus, Ohio, is having plans prepared for the construction of additions to its plant, which will double its capacity. P. H. Ryder is president and general manager of the company.

The Ideal Brass Company, of Cincinnati, Ohio, has been incorporated, with a capital of \$10,000, to manufacture brass articles. The incorporators are: C. C. Whitaker, W. G. Anderson, H. J. Esterman, John A. Hoff and C. B. Terry.

The Allyne Brass Foundry Company, of Cleveland, Ohio, has decreased its capital stock from \$50,000 to \$25,000.—J. W. L.

CHICAGO, ILL.

MAY 7, 1917.

The probability that the productive facilities in this district soon may be placed under unprecedented pressure receives a prompt co-operative response and business operations are speeded up in anticipation of emergencies. The situation here grows more difficult for producers of metal goods because of a greater variety of large needs in the metal working trades, many of which will be adapted to turning out military products when required. There is no accumulation of surplus stocks of brass goods on hand at the present time as all concerns are working on orders and are behind on same.

The plant of the Economy Manufacturing Company, manufacturers of screw machine products, metal specialties, air brushes and sprayers, located at 4753-55 London avenue, has been greatly increased, new machinery has been added, and in other ways the firm is showing evidence of growth.

The Stewart Manufacturing Company, located at Wells Street Bridge, are having quite a business on their reinforced die-cast bearings used by the automobile trade.

Overindulgence in buying some speculation and subsequent resales have been instrumental in lowering copper prices this past two weeks from their recent high levels. One thing that stands out as a prominent factor is the sale, by producers, to the United States Government at below 17 cents per pound. The feeling here generally prevails that this price established a precedent and that neither domestic consumers nor foreign governments will lay in large quantities of the metal until absolutely necessary, and then only after a downward readjustment of price has been granted. A revision of copper prices downward appears imminent is my prediction.—P. W. B.

DETROIT, MICH.

MAY 7, 1917.

The declaration of war against Germany by the United States has had but little effect on business conditions in Detroit and vicinity, where the brass, copper and aluminum trade is one of the leading branches of industry. While manufacturers appear somewhat nervous as to the future, nothing has yet occurred to indicate that business will in any way be affected. Every brass, copper and aluminum plant in the city is operating to capacity, with orders so far ahead that the end is nowhere in sight.

The only real trouble now facing this section is the shortage of freight cars. Unlike other sections, Detroit and vicinity have not yet fully recovered from the car shortage of last winter, and in spite of the best of management, conditions still are more or less serious. Lake navigation is just opening up and this is giving Detroit much relief. At the same time coal is short and dealers are still having all they can do in some instances to meet the demand of customers. All these conditions reflect on the metal industry the same as other lines of trade.

The automobile companies are way behind in filling orders. One of the leading manufacturing concerns here announces that it will be unable to fill its present orders for two months. These concerns also are having some trouble obtaining material as readily as desired, but thus far nothing serious has happened in this respect. Labor conditions are good so far as strikes are concerned; thus far no serious contentions appear to trouble manufacturers. The demand is strong for good mechanics and workers in the metal trades. Wages are high and manufacturers are taking on all the men they can get.—F. J. H.

LOUISVILLE, KY.

MAY 7, 1917.

Coppersmiths of the Louisville district report a general slump in business during the month, conditions in general being unsatisfactory, and the outbreak of the war stopping some prospects which had been favorable. All distilling operations are at a standstill, the plants being down, and likely to remain down for some time to come unless there is a general change. With corn at \$1.70 a bushel, when the normal price is 70 cents, and other

grain at correspondingly high prices, the distiller has no chance to operate profitably. Labor and coal are also out of sight and so is cooperage stock. Prohibition agitation has also been against the liquor industry, and a number of plants would not operate if the material and supply market was normal.

Louisville coppersmiths for many years have been handling a big volume of business on distilling plants, but conditions have changed so much in the past two years that no one is even considering such a thing as erecting distilleries. A few contracts have been obtained for fatty acid plants, etc., refining plants, and similar work, but liquor distilling is a dead letter just now.

Several of the local plants have been fairly busy on special silver bronze castings for use in manufacturing milk machinery, and pattern making has also been conducted along broad lines, the machinery manufacturers being overburdened with orders. One of the large manufacturers of machinery now has orders on his books which will keep him going for several months, and the demand for castings of brass, babbitt, bronze, etc., has been excellent.

The Louisville Fire Brick Company, manufacturers of material used in smelting of various kinds, is months behind on supplying its product, and officers report that it is no longer a novelty to turn down excellent orders which would have been considered gigantic a few months back.

C. J. Thoben, of the Vendome Copper & Brass Works, reports that things are very dull with that company, the bottom having dropped out from under the distillery erecting business, which has been its chief line. A year ago the company was so busy that it had to enlarge its plant.

J. W. Rademaker, of the Independent Brass Works, reports that he is good and busy on special castings for elevator manufacturers, car manufacturers, and for use in milk machinery. The use of silver bronze is steadily increasing, and a lot of this material is now being used in castings.

Building and construction work of all kinds has suffered during the past few months on account of the high cost of materials, lumber, etc., and the fact that conservatists wish to hold up their projects for the present, feeling uncertain concerning the war and its effect on ready cash. The result has been that the plumbing trade is very quiet, and the demand for plumbing supplies, brass and other goods is reported as decidedly dull by the local manufacturers and jobbers.

J. R. Hoe & Sons, Middlesboro, Ky., manufacturers of brass railroad journals, other railroad work, and general manufacturers of brass and other metal castings, will erect an addition to its plant, and will install additional machinery, including a hydraulic press and a 48-inch lathe.

TRENTON, N. J.

MAY 7, 1917.

That the metal workers of Trenton are patriotic and loyal to their country is shown in the fact that during the past month handsome American flags were raised from many of the large plants in this city. The 700 employees of the brass shop of the J. L. Mott Company, in addition to hundreds of employees of the various other departments and offices, raised a large flag, 15 by 25, over the main plant, and this was followed with appropriate exercises. An address was given by a clergyman and there was music by a brass quartet made up of employees. Each employee waved an individual flag as the "Star Spangled Banner" was played. The employees of the Skillman Hardware Manufacturing Company purchased a large flag, and William G. Wherry, president of the concern, had a large steel pole erected on the plant. Following the exercises, President Wherry invited the employees back into the plant, where a luncheon was served by the company.

The employees of the Trenton Brass and Machine Company and the Ingersoll-Trenton Watch Company also unfurled flags. At the latter plant more than 500 employees occupied seats on the company's lawn while the exercises were being held.

Announcement has been made by George F. Eberhard, general manager of the Ingersoll-Trenton Watch Company, that his company will in the near future begin work on an addition to the plant, which will more than double the capacity of the factory. Manager Eberhard and Charles H. Ingersoll, head of the concern, have completed the plans for the new addition. More than 500 hands are now employed at the local plant. Mr. Eber-

hard says that within a year he expects to employ about 1,200 hands. About a year ago the watch case department was taken from the local plant and moved to Waterbury, Conn., in order that the capacity of the works here might be doubled. This has been accomplished, and at the present time 1,000 watches are turned out at the local plant daily where previously there were only 500 made. The object in enlarging the local plant is to increase the output to 2,500 watches a day. Special machinery is now in course of construction, and when the addition to the plant is completed will be immediately installed. The Ingersoll company is now supplying 3,000 wrist watches a day for the American soldiers.

Metal manufacturers in this section have hopes for a busy season if the industrial hysteria on account of the war does not become too pronounced. William G. Wherry, president of the Skillman Hardware Manufacturing Company, said to a representative of THE METAL INDUSTRY: "Those who anticipate hard times are borrowing trouble, and if we all begin to economize business will be at a standstill. There is no cause for alarm. Plants have been enlarged throughout the country and there is plenty of money at hand. We should keep the plants in full running operation and not worry what may happen some time later on." Mr. Wherry, who recently returned from a trip to the Southern States, said that he found that in some sections there would not be much building this summer. The prices of various kinds of goods are very high and investors do not care about taking a chance of erecting plants and homes. When building operations take a drop, it hits the hardware business. Fortunately, the Skillman company finds no hard times and the plant is running full handed. Other local manufacturers, when interviewed, were of the same opinion.

The employees of the munitions department of the J. L. Mott Company were compelled to lay off for a few days because of a scarcity of metal material. Considerable brass is used in the manufacture of time fuses and this is shipped to the Mott plant in carloads. All the departments of the plant are busy.

Thomas Shegog, who recently formed the New Jersey Chemical Company on North Willow street, Trenton, N. J., has disposed of his interests in that concern. David Berkow and others will now conduct the business, they having been associated with Mr. Shegog in the recovery and utilization of zinc from galvanized iron, scraps, etc. Mr. Shegog expects to engage in a similar business later on.—C. A. L.

NEW YORK, N. Y.

MAY 7, 1917.

A special meeting of the New York Business Publishers was held on Monday, April 23, and a group of addresses was given by authorities pointing out the relation of the National Defense Board of our country to the business press. The following resolution was passed at the close of the meeting:

"Whereas there has been ably presented at this meeting of the New York Business Publishers by Charles H. Shessill and Glen Frank, the activities of the Council of National Defense and its Advisory departments, and

"Whereas the different members of the New York Business Publishers together with more than a hundred publishers in other cities of the country have definitely pledged themselves to co-operate with the Government and give free advertising space during the period of war, and

"Whereas the business papers of this country recognize their responsibility as well as their influence in backing up the activities of the Government in commercial preparedness, as well as the sale of bonds and recruiting, therefore be it

"Resolved that the New York Business Publishers through the organization of the Editorial Conference co-operate with all the branches of the Government with the purpose of obtaining the enthusiastic support of all the subscribers of the business papers who are individuals and corporations of importance in this country, and that said Editorial Conference should put out weekly bulletins to all the business papers, giving the results of its investigation and co-operation, and be it

"Further Resolved that we invite all the different branches of the Council of National Defense and its Advisory Boards to send to the New York Business Publishers all bulletins and requests for co-operation which will enable us to carry out the spirit of these resolutions."

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The American Drop Forge Association will hold its fourth annual convention in Cleveland, Ohio, June 14, 15 and 16, 1917.

The Simplex Foundry Company, 237 Spruce street, Columbus, Ohio, has commenced operating its new aluminum castings foundry.

The John A. Roebling's Sons Company, Trenton, N. J., manufacturer of wire and wire rope, has filed plans for a new power plant addition to cost about \$10,000.

The Waterbury Clock Company, Waterbury, Conn., has awarded a contract for an addition to its plant, 73x114 feet, seven stories to be used for the manufacture of watch crystals.

The one story, 120x280 feet, addition to the plant of the New Jersey Tube Company, manufacturers of sheet brass and brass tubing, Harrison, N. J., has been completed.

The Roberts Brass Manufacturing Company, specializing in plumbing goods, automobile parts, etc., Detroit, Mich., through E. W. Roberts, vice-president, announces that its business has increased 70 per cent. during the past year.

The contract for the steel work for the new addition to the foundry of the Bristol Brass Company has been let. The building will be 48x20 feet, one story high. The large number of unfilled orders on hand has made the addition necessary.

The Jenkins Machine Company, Sheboygan, Wis., maker of wood and metal working machinery, is building a new enameling shop. Besides an enameling department, the company operates a tool room, casting shop and stamping and japanning departments.

Henry Horkman, manager of the Neenah Brass Works, Neenah, Wis., advises that the report that that company is contemplating the erection of an addition to its foundry which will increase the capacity 50 to 75 per cent. is not correct.

The Hanson & Van Winkle Company, Newark, N. J., manufacturer of chemicals and electro-platers' supplies, will build a one-story brick addition to its foundry at 321 Chestnut street, 40 x 40 feet. The company will also build a one story, 40 x 100 feet, carpenter shop.

John P. Smith & Company, manufacturers of wire dipping baskets, machine guards, wire cloth and wire goods for all purposes, have taken the premises adjoining their show room at 495 State street, New Haven, Conn., which will give them more than double their present display space and increase their facilities for handling orders.

Walter B. Taylor, brass founder, 29 Jackson street, Worcester, Mass., has awarded the contract for the erection of a foundry building at Grove and Brookfield streets. The building, which will cost about \$10,000, will be ready for occupancy about June 1, when Mr. Taylor will remove his business from Jackson street.

The Pangborn Corporation, Hagerstown, Md., has purchased and taken over the sand-blast business conducted by Elmer E. Perkins and George A. Cooley, Monadnock block, Chicago, Ill. Mr. Cooley will join forces with the Pangborn corporation, and Mr. Perkins will continue in his parent line of condensing driers and dry kilns.

The Bridgeport Testing Laboratory, 388 John street, Bridgeport, Conn., now occupy the entire building at that address and have greatly increased their facilities for doing analytical work, etc. They have added to their staff a chemist thoroughly experienced in iron work and are making a specialty of that department in addition to non-ferrous work.

The United Smelting & Aluminum Company, New Haven, Conn., who are large producers of aluminum ingots and sheet aluminum, etc., have signified to the Secretary of War their willingness to turn over their New Haven plant and also their new ten acre plant at Hamden, Conn., to the United States Government, should the properties be desired.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., has awarded the general contract for the erection of a new plant at Newark, N. J., to cost about \$350,000. It will replace the present factory, which is now occupying leased quarters, and will be of brick, steel and concrete, 75x374 feet, six stories and basement, and will employ 400 men. Additions costing \$350,000 or more at Manitowoc are now being completed. George Vits is president.

The American Metal Works, Armat and Heiskel streets, Germantown, Philadelphia, Pa., is erecting a plant on Stanton avenue, to be used for the manufacture of stamped metal goods and metal electrical specialties. The factory will consist of two buildings, a main factory, 60x320 feet, two stories, and an adjoining two-story structure, 40x115 feet. The plant is estimated to cost \$125,000 and will be placed in operation about September 1, when it will give employment to about 250 hands. The plant will include a machine shop, drawing, stamping, plating, polishing, japanning and lacquering departments.

The Fixture Spray Company, 549 West Twenty-second St., New York, announce that they are now prepared to send their men with outfits for producing "Saxowhite" finish anywhere in the country. This finish is applied to any surface such as metal, wood, etc., in white or colors. The Fixture Spray Company is making a specialty of finishing the metal fittings of residences, yachts, etc., by means of their portable outfits, and state that they have been very successful. As the finish is not affected by salt air polishing and cleaning is eliminated. Another advantage of this method is that the fixtures are refinished without disconnecting them.

The Bridgeport Brass Company, Bridgeport, Conn., announce that they have acquired by purchase the Standard Brass and Copper Tube Company, of New London, Conn. The factory of the latter concern, which was erected about eight years ago and devoted exclusively to drawing seamless brass and copper tube, has been twice increased in size so that the present output is double the original capacity of the plant. Operations have been immediately started by the Bridgeport Brass Company to still further increase the capacity of this plant, in order to afford better delivery service to their customers, on this class of product. The New London plant will, of course, be under the direct supervision of, and operated as a branch of the Bridgeport works.

Recent developments in respect to government purchases of metals as reported in the daily press are as follows:

The Government is to buy 100,000,000 pounds of copper additional, but in place of paying only 16 $\frac{2}{3}$ cents a pound will pay a price above 20 cents a pound—probably close to 24 cents.

Instead of only purchasing a total of 15,000 tons lead, the Government is actually in the market for 100,000 tons of this metal, the order for which is to be placed very soon.

Arrangements for the purchase of spelter are not being hastened, due to various conditions that prevent smelters from offering the Government a low price. Estimates place the prospective Government order at 35,000 tons.

GENERAL ELECTRIC'S PROFITS

According to the twenty-fifth annual report of the General Electric Company, the profit for the period ended December 31, 1916, amounted to \$15,294,091. The net income reached \$19,160,973. Orders received for electrical machinery and supplies were valued at \$167,169,058, an increase of 70 per cent. over 1915. War munition orders amounted to \$2,416,000. Additions to manufacturing facilities cost \$8,828,254.

BUSINESS TROUBLES

The report of the Credit Men's Adjustment Bureau Company of Cleveland, Ohio, on the receivership of the Coleman Foundry & Equipment Company, also of Cleveland, was as follows: Receipts from sale of assets, cash in till, and accounts receivable amounted to \$4,864.69. Disbursements, including the expense of administration, receiver's and trustee's compensation, trustee's attorney fees, referee's costs and preferred claims, \$4,864.69. The estate was closed with no dividend to general creditors.

METAL PLANTS PROFITS

The Butte and Superior Mining Company, the largest producer of zinc in this country, reports a gross income of \$13,141,551 in 1916, a gain of \$1,054,434 over the preceding year. Operating expenses advanced \$1,300,000 as compared with the total for 1915, and the balance of \$8,873,446 available for dividends was \$333,817 less than the year before. This was equal to \$30.57 on the outstanding stock, against \$33.47.

The company paid out \$9,490,430 in dividends, which entailed a call upon surplus to the amount of \$616,984, compared with a gain in surplus amounting to \$4,217,833 in 1915. The balance sheet showed undivided profits of \$5,610,722 when the year ended.

The American Brass Company, Waterbury, Conn., has declared the regular quarterly dividend of 1½ per cent. and an extra dividend of 11 per cent., both payable May 15 to stock of record April 30.

NAVY BIDS

Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., to which bureau firms desiring to submit bids should apply, giving schedule numbers for furnishing the following: Schedule 975, brass standard bolts, nuts, ingot aluminum and ingot antimony; schedule 980, phosphor bronze wire; schedule 985, crucibles; schedule 986, pig lead, sheet lead, and lead pipe; schedule 987, slab, sheet and blank-hull zinc; schedule 988, sheet-rolled boiler zinc; schedule 989, rolled-brass plates; schedule 996, two-headed buffing lathes.

NEW METAL PRODUCTS CONCERN

Col. J. H. Hansjosten, well known to the plating trade as a plater and salesman of plating supplies, and also as past supreme president of the American Electro-Platers' Society, has organized the Kokomo Metal Products Company, of Kokomo, Ind., and will from now on manage the affairs of that company.

The Kokomo Metal Products Company will manufacture cast and sheet iron and steel specialties, and do a general job plating and enameling business. The plating and polishing equipment will be complete in every detail, and will include steel ball burnishing and mechanical plating devices. Nickel, copper, bronze, brass, zinc, gold and silver plating will be done. They will be able to handle large quantities of work, as both the still plating and mechanical plating equipment will be ample and modern.

The polishing and plating machinery is being installed now, and orders have been placed for the ball burnishing equipment, and which will be installed as soon as possible. A brass foundry is also being considered, but will not be installed until some time in the future. The company already has a number of orders, and the prospects for a large volume of business are very good.

KALBFLEISCH CORPORATION

The Kalbfleisch Corporation, recently organized, has purchased all the interests of the Franklin H. Kalbfleisch Company, Erie Chemical Works and the Kaloid Company. This is one of the most important developments that have recently taken place in the chemical trade in this country. The new corporation will own five plants, one each at Brooklyn, N. Y.; Waterbury, Conn.; Elizabethport, N. J.; Erie, Pa., and Chattanooga, Tenn., and a greatly enlarged output is already being manufactured. The Brooklyn, Waterbury and Elizabethport plants turn out a line of acids and heavy chemicals, among which, of first importance probably, is the well known Kalbfleisch

brimstone sulphuric acid. This insures a line of pure commercial products—nitric acid, muriatic acid, sulphate of alumina, sulphate of soda, etc. The Erie and Chattanooga works (the latter having been recently completed) manufacture a full line of the different grades of sulphate of alumina and alum for paper makers, filter plants, manufacturers of colors, etc.

The officers of the corporation are as follows: Franklin H. Kalbfleisch, chairman of the board of directors; Robert S. Perry, president; Alfred B. Savage, vice-president and treasurer; Richard Sheldrick, secretary. The directors are the same with the addition of Harry L. Derby.

INCREASE IN CAPITAL STOCK

R. B. Siedel, Inc., Philadelphia, Pa., manufacturer of crucibles, will make improvements in its plant, at 1322 Callowhill street, to cost about \$30,000.

The Bridgeport Brass Company, Bridgeport, Conn., has increased its capital stock from \$2,000,000 to \$5,000,000. Employees of the Bridgeport Brass Company, who have been in the service of the company during the months of January, February and March, received on May 1 a bonus of 5 per cent. of their wages for that period. The total amount distributed was about \$25,000.

The Lubricating Metal Company, 2 Rector street, New York, has increased its capital stock from \$100,000 to \$500,000, and has in addition issued \$100,000 of 7 per cent gold debenture convertible bonds. These issues are to provide working capital to handle its greatly increased business, and to pay for its new factory at Jersey City, N. J., with its additional equipment for the manufacture of bearing metal.

The American Metal Cap Company, Summit street, Brooklyn, N. Y., manufacturers of metal caps for bottles and kindred specialties, has increased its capital from \$150,000 to \$500,000. Charles E. Pope, former president of the Pope Sheet & Tin Plate Company, has entered the corporation, and is at the present time chairman of the board of directors. A cutting-up shop, and stamping, japanning and lacquering departments are operated by this company.

CHANGE IN FIRM NAME

C. J. Franz and R. G. Holbrook, who have been operating the Hewitt Bearing Metal Company, manufacturers of Hewitt bronze bearing metals, Newark, N. J., for the last few years, have decided to adopt the trade name of Franz-Holbrook Bronze Company.

The German-American Stoneware Works, manufacturers of chemical stoneware, 50 Church street, New York, has changed its name to the General Ceramics Company. This company was originally organized for the sole purpose of manufacturing high grade chemical stoneware, but during the past few years it has increased its lines of manufactures to include a large variety of ceramic products.

The McKenna Brothers Brass Company, manufacturers of brass and brass goods, Pittsburgh, Pa., has been incorporated under a new firm name, and will be known as the McKenna Brass & Manufacturing Company. The company is incorporated with a capital stock of \$400,000, and the incorporators are: T. Morrison McKenna, C. H. McKenna and F. S. McKenna. The firm will continue manufacturing the same line of goods it has heretofore, and operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding rooms, casting shop, cutting-up shop, brazing, soldering, plating, polishing, japanning and lacquering departments.

REMOVAL

Charles Schaeffer, well-known electroplater, located at 23 John street, New York, has moved his plant to 47 Ann street, New York.

Edward Le Bas & Company, foreign distributors for the

American Boron Products Company, Reading, Pa., moved on May 1 from 82 Beaver street to 62 Broad street, New York.

The New York office of the American Tube Works, of Boston, Mass., has been moved from 11 Cliff street, New York, to 501 Fifth avenue, corner Forty-second street.

The Metals Production Equipment Company, designers and builders of over-fired, accurate temperature, heat-treating furnaces, have moved their New York office from 105 West Fortieth street, to the City Investing building, 165 Broadway.

The New York office of the Electrical Alloys Company, Morristown, N. J., manufacturers of electric resistance materials, German silver, Monel metal, nickel wire, etc., which is in charge of W. A. Hartigan, has been moved from 41 Union Square to 135 Broadway.

The Mott Sand Blast Manufacturing Company, manufacturers of sand blast apparatus and allied equipment, owing to rapidly increasing business, has moved its factory from 1157 East 138th street, New York, to its new plant at 2, 4, 6 and 8 Frost street, Brooklyn, N. Y.

The O. J. Moussette Company, Inc., have moved from Driggs avenue to 22, 24 and 26 Clay street, Brooklyn, N. Y., where they have larger and better facilities for the manufacture of the Monarch and Ideal cinder crushers and pulverizers, spiral efficiency pulverizers and other machinery.

The principal offices of the Jordan L. Mott Company have been removed from Fifth avenue, New York, to the plant at Trenton, N. J., where the work can be more centralized. About sixty-five persons employed at the New York offices were transferred to Trenton. The salesrooms will be continued in New York.

The Lawrenceville Bronze Company, copper and brass founders, Pittsburgh, Pa., has moved its foundry to Zelienople, Pa., where it recently purchased the plant of the Kerner Manufacturing Company. The plant has been equipped with modern apparatus for the manufacture of heavy brass, bronze and copper castings, and will have a capacity of turning out 10 to 12 tons per day. Albert C. Barbour, formerly superintendent of the foundry at Pittsburgh, has been made district sales agent, with offices in Pittsburgh.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To Manufacture Jewelry.—Allsopp Brothers, 26 Camp street, Newark, N. J.; capital, \$200,000. Incorporators: George A., George A., Jr., and Clifford Allsopp.

To manufacture jewelry, etc.—K. E. M. Company, Newark, N. J. Capital, \$50,000. Incorporators: Charles M. Kulish, John Manthey, Henry C. Erlacker, Newark, N. J.

To manufacture and deal in jewelry of all kinds.—Barnet, Inc., Newark, N. J. Capital, \$100,000. Incorporators: Joseph G. Barnett, Herbert Z. Steiner, Martha H. Checkley, Newark.

To manufacture and deal in brass and other metals.—Columbia Bronze Foundry Company, Camden, N. J. Capital, \$10,000. Incorporators: William Early, Frederick T. Hyde, A. J. Weeks, Camden, N. J.

To manufacture gold and silver articles.—National Products Manufacturing Company, Newark, N. J. Capital, \$100,000. Incorporators: Bernard J. Radigan, Robert J. Metzler, Joseph Kruttschnitt, Newark, N. J.

To manufacture cutlery and metal specialties.—H. A. La

Motte & Company, Ridgefield Park, N. J. Capital, \$25,000. Incorporators: R. and F. E. Leslie and John Raold. The company operates a grinding and tool room, stamping, soldering, plating and polishing departments.

To manufacture tools and metal specialties.—The Hudson Metal Manufacturing Company, 141 Railroad avenue, Jersey City, N. J. Capital, \$25,000. Samuel Schnabolk and Axel Salstrom, incorporators. The company operates a brass machine shop, tool and grinding rooms, spinning, stamping, soldering, plating, polishing, japanning and lacquering departments.

To manufacture metal specialties.—The Randall Metal Manufacturing Company, 39 South Charles street, Baltimore, Md. Capital, \$10,000. Incorporators: William D. Randall, Walter R. Lyon and Aubrey Pearre, Jr. The company will operate a brass machine shop, tool and grinding rooms, spinning, stamping, brazing, soldering, plating, polishing, japanning and lacquering departments.

To manufacture plumbers' brass goods and specialties.—The Mid West Brass Manufacturing Company, North Aurora, Ill. This company has been organized with Peter W. Blair, formerly connected with the Mueller Manufacturing Company, Sarnia, Ont., Canada, as president, and Joseph F. Berthold, formerly secretary and treasurer of the Biever Manufacturing Company, as secretary and treasurer. The company has taken over the equipment and plant formerly operated by the Biever Manufacturing Company of North Aurora. The Mid West Company operates a foundry, brass machine shop and plating and polishing department.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Beryllium.—A full description of this little known element, by Professor C. James, of New Hampshire College, Durham, N. H., is given in Mineral Foote-Notes for April, 1917, which is issued by the Foote Mineral Company, Philadelphia, Pa. This little booklet gives prices and market news of rare metals, ores and alloys.

Accident Statistics.—The Scovill Manufacturing, Waterbury, Conn., have issued a complete report of the accidents occurring at the works of the company for 1916, and in addition to the mere statistical tabulation of the accidents and their causes, the report also includes the methods which were adopted with a view of preventing the recurrence of similar accidents.

Drop Presses.—The Standard Machinery Company, Auburn, R. I., manufacturers of presses of all kinds, rolling mill machinery, etc., have issued the twelfth edition of their catalog for 1918. The catalog is made up of sixty-five pages and gives full descriptions and illustrations of the varied line of automatic drop and geared power presses manufactured by this concern. Inquiries are solicited on all sheet metal machinery, dies, tools and forgings and so forth.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

NEW YORK, May 7, 1917.

COPPER.

Lack of interest and receding prices marked the copper industry during the first half of April, with uncertainty as to future developments regarding the needs of not only the United States Government, but also in regard to the needs of our Allies and the price at which this country will be obliged to furnish the metal. In the last half of the month a decided decline developed in prices both at home and abroad which developed into merely nominal quotations, there being practically no business transacted.

In the closing week of April came various rumors, which contributed to unsettle the industry, and on the 30th, Prime Lake was nominal at 30.50 to 31 cents for prompt and early positions, with electrolytic, same deliveries, 31 to 31½ cents; casting copper was 27½ to 28½; June electrolytic, 30 to 30½ cents, with third quarter at 26 to 27 cents. The foreign market for spot electrolytic was £142.

TIN.

Many interesting points developed in the tin industry during April. Large arrivals at Pacific ports and by way of the Panama canal attracted attention, the Dutch Steamship line abandoning its former route by way of the Suez canal for the remainder of the war, in preference for the safer Panama route, back to its home port in Holland. The advantage of the overland route in facilitating deliveries to interior points was also noted.

The smelting of tin in this country received fresh impetus, the Williams & Harvey Corporation beginning the erection of a plant on land in Jamaica bay that will have an annual producing capacity of 20,000 tons—Bolivian ores are to be used. The Bethlehem Steel Company, it was announced, has now an annual capacity of 1,000,000 base boxes tin plate that will be doubled when the plant is completed.

The price of spot tin registered a net advance of 4 cents—from 54.50 at the beginning of the month, to 58.50 on the 26th, with indications of a further rise. A few days later 58.50 cents was asked for spot tin, and by the 30th this price was paid with 59 cents being asked.

Total arrivals of tin for April up to the 30th were reported to be 2,145 tons, with tin afloat, 2,812 tons.

SPELTER.

The month of April in the spelter trade will be remembered because of its absolute dullness, although in the closing week some activity developed and a few sales were made. Prices had receded ½ cent on all positions by the 26th, when prompt-April-May were sold at 9.05 to 9.30; June, 8.92½ to 9.05; New York, and with St. Louis, 8.87½ to 9.12½ for prompt-April-May; June, 8.75 to 8.81½ cents. The market closed ½ cent higher, with spelter at 9.55 and 9.67 New York.

LEAD.

The lead market, after being steady but rather dull during the first fortnight, with premiums that had been asked for early deliveries disappearing, became very firm and strong upon the announcement by the United States Government that very large quantities will be needed for army and navy requirements, first estimates indicating 50,000 tons for the remainder of the current year. The price adjustment with the government was not yet arranged on the 30th.

At the beginning of the month there was a fractional decline of ¼, which was recovered during the second week when better buying developed. In the third week, when the needs of the Government became known, an active demand set in which carried prices upward gradually while the market became very firm as danger of greater scarcity of metal increased. Spot and May sold at 10 cents New York at close.

ANTIMONY.

The scarcity of spot antimony in New York maintained prices at 36 cents up to the 12th, but with arrivals overland from the Pacific and by way of Panama, as well as at the Atlantic seaboard, during the third week, a decline in prices gradually carried prices downward to 32 to 32½ cents on the 30th, a net recession of 3½ to 4 cents. The demand for future delivery through-

out the latter half exceeded that for spot, the latter becoming dull and easier.

ALUMINUM.

The growing importance of aluminum in the metal trade was emphasized during the month, when it was mentioned as a competitor of copper and tin-plate in the trade when the war shall have ceased. War-time needs has brought it into prominence, bringing out its adaptability to other uses wherever a strong, light weight metal is required. The market during the month was steady, although not very active, at unchanged prices for No. 1 Virgin, 59 to 61, but with a gain of 1 cent on pure 98 to 99 per cent. remelted, and on No. 12 alloy remelted to 56 to 58 for the former, and 40 to 42 for the latter.

SILVER.

The price of silver was subject to rapid variations during the month; opening at an advance of 1¼ cents to 74½ cents on the 2nd, it fluctuated back and forth in a range of 2 cents to 74½ cents on the 20th, the highest point, after which fractional recessions carried to the lowest point, 72¾ cents, on the 23rd. Another advance immediately set in which by the 30th had reached 74¾ cents.

QUICKSILVER.

Quicksilver suffered a net decline of \$7 per flask during April, from \$120 at the opening to \$113 on the 26th. Fluctuations were sharp when on the 9th a decline of \$5 per flask was recovered the following day, only to be lost again on the 14th; on the 16th \$120 was again registered, after which the decline was more gradual until the 19th, when \$113 per flask was the price, where it remained stationary to the 30th.

PLATINUM.

The war-time needs of the United States Government for scientific and chemical purposes brought the scarcity of platinum and the almost prohibitive prices—five times the cost of gold—into unusual prominence during April. An appeal was made through the press to the general public to refrain from purchases of the metal in the form of jewelry or other ornamental devices, and to jewelers to use substitutes in the setting of gems, in order to conserve the supply. Prices remained stationary at \$105 for pure and \$110 for 10 per cent. iridium.

OLD METALS.

A hesitancy due to the uncertainty of future developments was apparent in the old metals market during the first fortnight, which gradually, as the month progressed, made itself felt in various recessions in prices, notably in the copper scrap. Aluminum, German silver and lead, however, were exceptions which maintained a strong position. Block tin pipe and tin foil advanced 2 cents in the second week. A notable feature was that buying was confined to spot and early deliveries, the entire absence of future buying attracting considerable attention. The sliding prices of copper were pronounced in effect upon the scrap coppers in the closing week, when a recession of 1 cent to 3 cents was noted throughout the list, followed by a recovery and greater activity.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper, 1916—Average for year, 28.77. 1917—January, 32.25. February, 35.25. March, 35.50. April, 32.75.

Brass Mill Spelter, 1916—Average for year, 17.725. 1917—January, 13.05. February, 13.80. March, 13.45. April, 11.85.

APRIL MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER—			
Lake	35.00	30.50	32.462
Electrolytic	34.50	30.00	32.187
Casting	31.25	26.75	29.237
TIN	58.75	54.37½	55.907
LEAD	10.00	9.12½	9.531
SPELTER	10.67½	8.92½	9.728
Antimony	36.00	32.25	34.662
Aluminum	61.00	59.00	60.00
Quicksilver (per flask).....	\$120.00	\$113.00	\$116.00
Silver (cts. per oz.).....	74¾	72¾	73.885

Metal Prices, May 7, 1917

NEW METALS.

Price per lb.

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.

Manufactured 5 per centum.

Lake, carload lots, nominal.....	31.50
Electrolytic, carload lots.....	32.00
Casting, carload lots.....	29.50

TIN—Duty Free.

Straits of Malacca, carload lots.....	58.75
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LEAD—Duty Pig, Bars and Old 25%; pipe and sheets.

20%. Pig lead, carload lots.....	10.25
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SPELTER—Duty 15%.

Brass Special	9.75
Prime Western, carload lots, nominal.....	9.55

ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.

Small lots, f. o. b. factory.....	67.00
100-lb. f. o. b. factory.....	64.00
Ton lots, f. o. b. factory.....	60.00

ANTIMONY—Duty 10%.

Cookson's, Hallet's or American.....	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot..	27.00

NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.

Shot or Ingots.....	50 and 55c.
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ELECTROLYTIC—5 cents per pound extra.

MANGANESE METAL

Nominal

MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots) \$3.00

BISMUTH—Duty free

\$3.00

CADMIUM—Duty free.....

nominal \$1.50

CHROMIUM METAL—Duty free.....

.75

COBALT—97% pure.....

\$1.70

QUICKSILVER—Duty, 10% per flask of 75 pounds.....

\$115.00

PLATINUM—Duty free, per ounce.....

\$105.00 to \$110.00

SILVER—Government assay—Duty free, per ounce.....

.75½

GOLD—Duty free, per ounce.....

\$20.67

INGOT METALS.

Price per lb.

Silicon Copper, 10%.....	according to quantity	53 to 55
Silicon Copper, 20%.....	"	53 to 55
Silicon Copper, 30% guaranteed..	"	55 to 60
Phosphor Copper, guaranteed 15%	"	62¼ to 66
Phosphor Copper, guaranteed 10%	"	62¼ to 65
Manganese Copper, 30%, 2% Iron	"	75 to 80
Phosphor Tin, guaranteed 5%...	"	74 to 76
Phosphor, Tin, no guarantee.....	"	55 to 60
Brass Ingot, Yellow.....	"	23¼ to 26
Brass Ingot, Red.....	"	28½ to 31
Bronze Ingot	"	29 to 31
Parsons Manganese Bronze Ingots	"	33½ to 36
Manganese Bronze Castings.....	"	39 to 48
Manganese Bronze Ingots.....	"	28 to 34
Phosphor Bronze.....	"	34 to 36
Casting Aluminum Alloys.....	"	45 to 47

OLD METALS.

Dealers' Buying Prices.	Dealers' Selling Prices.
26.50 to 27.00 Heavy Cut Copper.....	29.50 to 30.00
25.00 to 26.00 Copper Wire.....	27.00 to 28.00
22.00 to 23.00 Light Copper	24.00 to 25.00
22.50 to 23.00 Heavy Mach. Comp.....	24.50 to 25.00
16.00 to 16.50 Heavy Brass.....	18.00 to 20.50
12.50 to 13.50 Light Brass.....	14.50 to 15.50
16.50 to 17.00 No. 1 Yellow Brass Turning.....	18.50 to 19.00
19.00 to 20.00 No. 1 Comp. Turnings.....	19.50 to 21.00
8.00 to 8.25 Heavy Lead.....	8.62 to 8.75
8.00 to 8.50 Zinc Scrap.....	9.00 to 9.50
23.00 to 23.50 Scrap Aluminum Turnings.....	25.00 to 25.50
33.00 to 34.00 Scrap Aluminum, cast alloyed.....	36.00 to 37.00
49.00 to 50.00 Scrap Aluminum, sheet (new).....	52.00 to 53.00
39.00 to 40.00 No. 1 Pewter.....	41.00 to 42.00
30.00 to 32.00 Old Nickel.....	34.00 to 36.00
23.00 to 25.00 Old Nickel anodes.....	26.00 to 27.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) 40c. base net
From stock 42c. base net

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	1½	2	2½	
	Longer than 72 inches.	"	"	"	"	1	2	3	4	
	Not longer than 96 inches.	"	"	"	"	1	2	3	4	
	Longer than 96 inches.	"	"	"	"	1	2	3	4	
Wider than 30 ins., but not wider than 36 ins.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches.	"	"	"	"	1	2	4	6	8
	Not longer than 96 inches.	"	"	"	"	1	2	3	4	
	Longer than 96 inches.	"	"	"	"	1	2	3	4	
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches.	"	"	1	3	4	5	7	9	
	Not longer than 96 inches.	"	"	2	4	6	9			
	Longer than 96 inches.	"	"	1	3	6				
Wider than 48 ins., but not wider than 60 ins.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches.	"	"	2	4	7	10			
	Not longer than 96 inches.	"	"	1	3	6				
	Longer than 96 inches.	"	"	1	3	6				
Wider than 60 ins., but not wider than 72 ins.	Not longer than 72 inches.	Base	1	3	8					
	Longer than 96 inches.	"	2	5	10					
	Not longer than 120 inches.	"	1	3	8					
	Longer than 120 inches.	"	1	3	6					
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	"	2	4	7					
	Not longer than 120 inches.	"	3	5	9					
	Not longer than 120 inches.	"	4	6						
	Not longer than 120 inches.	"	4	6						

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PAT-
TERN SHEETS, advance per pound over prices of Sheet Copper
required to cut them from..... 8c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices
of Sheet Copper required to cut them from..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier,
advance per pound over foregoing prices..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square
foot, advance per pound over foregoing prices..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled
Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square
foot over the price of Cold Rolled Copper..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over
the price of Cold Rolled Copper..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full
size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices
and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for
Polished Copper 1c.

Metal Prices, May 7, 1917

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect April 25, 1917.

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet.....	\$0.38	\$0.41½	\$0.44
Wire.....	.38	.41½	.44
Rod.....	.38	.42½	.45
Brazed tubing.....	.45	—	.51
Open seam tubing.....	.45	—	.51
Angles and channels.....	.45	—	.51

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet.....	\$0.40	\$0.43½	\$0.46
Wire.....	.40	.43½	.46
Rod.....	.40	.44½	.47
Brazed tubing.....	.47	—	.53
Open seam tubing.....	.47	—	.53
Angles and channels.....	.47	—	.53

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

35c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order.....	47c.	per lb. base
100 lbs. to 300 lbs. in one order.....	47½c.	" "
Less than 100 lbs. in one order.....	49c.	" "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3¼ O. D. Nos. 4 to 13 Stub's Gauge. — per lb.
Seamless Copper Tubing. — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

¾	1	1½	2	2½	3	3½	4	4½	5
Due to fluctuations of the metal market we are unable to quote these prices.									

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod.....	40½c.	net base
Muntz or Yellow Metal Sheathing (14" x 48").....	.36c.	" "
Muntz or Yellow Metal Rectangular sheets other than sheathing.....	.43c.	" "
Muntz or Yellow Metal Rod.....	.36c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 65c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF NICKEL ANODES.

45 to 87% purity.....	50c.	per lb.
90 to 92% ".....	52½c.	" "
93 to 97% ".....	55c.	" "

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS.

Phosphorus—Duty free, according to quantity.....	Nominal
Nickel Salts, Single bbl.....	14c. per lb.
Nickel Salts, Double bbl.....	11c. " "
Sodium Cyanide.....	Nominal
Silver Nitrate, 100 oz. lots.....	50.08c. per oz.
Sodium Carbonate (Sal Soda).....	.05c. per lb.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

PRICE LIST SEAMLESS ALUMINUM TUBING.

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

PRICES OF SHEET ZINC.

Duty, sheet, 15%.....	Cents per lb.
Carlond lots, standard sizes and gauges, at mill.....	19 cent basis, less 8%
Casks, jobbers' prices.....	21.00
Open casks, jobbers' prices.....	21.50

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%.....	48½c.	10%.....	53c.
8%.....	49½c.	18%.....	53½c.
10%.....	49½c.	20%.....	55½c.
12%.....	51½c.	25%.....	63c.
15%.....	52c.	30%.....	68½c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%.....	50c.	15%.....	58c.
8%.....	52c.	16%.....	58½c.
10%.....	54c.	18%.....	60½c.
12%.....	55c.	30%.....	76c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.
No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 25 to 50 lbs. 9c. over, less than 25 lbs. 15c. over.
Above prices f. o. b. mill.
Prices on wider or thinner metal on request.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.

Prices for Cotton Buffs.

Open buffs per 100 sections.	
12 inch, 20 ply, 64/68, cloth.....	base \$32.30
14 " 20 " 64/68, ".....	" 43.35
12 " 20 " 84/82, ".....	" 38.55
14 " 20 " 84/82, ".....	" 50.00
Sewed buffs per pound.	
Bleached and unbleached.....	base 34c.
Colored.....	" 31c.